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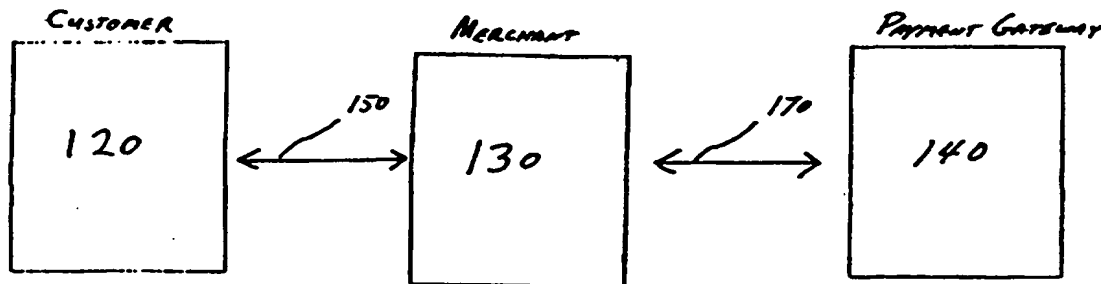
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(54) Title: A SYSTEM, METHOD AND ARTICLE OF MANUFACTURE FOR MANAGING TRANSACTIONS IN A HIGH AVAILABILITY SYSTEM



(57) Abstract

An architecture is disclosed allowing a server to communicate bidirectionally with a gateway over a first communication link, over which service requests are initiated by the server. In response to a transaction received from a host legacy system at the gateway, the gateway parses one or more transaction response values from the host message, maps the one or more transaction response values to a canonical response code, and stores the canonical response code in a transaction log. According to a broad aspect of a preferred embodiment of the invention, communication networks that employ transactions between applications must effectively manage transactions that flow over the network. In addition, networking systems must also detect counterfeit transactions, especially, when the networking systems are utilized for financial transactions. An active, on-line database is utilized as a transaction log to track original requests, valid retries and detect fraudulent transactions. The transaction log serves as a memory cache where the received host response is returned to a valid retry transaction should the original response fail to reach a server because of a communications problem.

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**A SYSTEM, METHOD AND ARTICLE OF MANUFACTURE
FOR MANAGING TRANSACTIONS IN A HIGH AVAILABILITY SYSTEM**

Field Of The Invention

5 The present invention relates to the secure, electronic payment in exchange for
goods and services purchased over a communication network, and more specifically,
to a system, method and article of manufacture for securely transmitting payment
information from a customer to a merchant to a payment gateway and returning a
certification, including a credit confidence factor to allow a merchant to determine
10 whether to accept or reject payment information utilizing a flexible, extensible
architecture.

The present invention relates to an electronic graphical representation of a monetary
system for implementing electronic money payments as an alternative medium of
15 economic exchange to cash, checks, credit and debit cards, and electronic funds
transfer. The Electronic-Monetary System is a hybrid of currency, check, card
payment systems, and electronic funds transfer systems, possessing many of the
benefits of these systems with few of their limitations. The system utilizes electronic
representations of money which are designed to be universally accepted and
20 exchanged as economic value by subscribers of the monetary system.

Today, approximately 350 billion coin and currency transactions occur between
individuals and institutions every year. The extensive use of coin and currency
transactions has limited the automation of individual transactions such as
25 purchases, fares, and bank account deposits and withdrawals. Individual cash
transactions are burdened by the need to have the correct amount of cash or
providing change therefor. Furthermore, the handling and managing of paper cash
and coins is inconvenient, costly and time consuming for both individuals and
financial institutions.

30 Although checks may be written for any specific amount up to the amount available
in the account, checks have very limited transferability and must be supplied from a
physical inventory. Paper-based checking systems do not offer sufficient relief from
the limitations of cash transactions, sharing many of the inconveniences of handling
35 currency while adding the inherent delays associated with processing checks. To this

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end, economic exchange has striven for greater convenience at a lower cost, while also seeking improved security.

5 Automation has achieved some of these qualities for large transactions through computerized electronic funds transfer ("EFT") systems. Electronic funds transfer is essentially a process of value exchange achieved through the banking system's centralized computer transactions. EFT services are a transfer of payments utilizing electronic "checks," which are used primarily by large commercial organizations.

10 The Clearing House (ACH) where a user can enter a pre-authorized code and download information with billing occurring later, and a Point Of Sale (POS) system where a transaction is processed by connecting with a central computer for authorization for the transaction granted or denied immediately are examples of EFT systems that are utilized by retail and commercial organizations. However, the
15 payments made through these types of EFT systems are limited in that they cannot be performed without the banking system. Moreover, ACH transactions usually cannot be performed during off business hours.

20 Home Banking bill payment services are examples of an EFT system used by individuals to make payments from a home computer. Currently, home banking initiatives have found few customers. Of the banks that have offered services for payments, account transfers and information over the telephone lines using personal computers, less than one percent of the bank's customers are using the service. One reason that Home Banking has not been a successful product is
25 because the customer cannot deposit and withdraw money as needed in this type of system.

30 Current EFT systems, credit cards, or debit cards, which are used in conjunction with an on-line system to transfer money between accounts, such as between the account of a merchant and that of a customer, cannot satisfy the need for an automated transaction system providing an ergonomic interface. Examples of EFT systems which provide non-ergonomic interfaces are disclosed in US Patents Numbers 5,476,259; 5,459,304; 5,452,352; 5,448,045; 5,478,993; 5,455,407; 5,453,601; 5,465,291; and 5,485,510.

35 To implement an automated, convenient transaction that can dispense some form of economic value, there has been a trend towards off-line payments. For example,

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numerous ideas have been proposed for some form of "electronic money" that can be used in cashless payment transactions as alternatives to the traditional currency and check types of payment systems. See U.S. Pat. No. 4,977,595, entitled "METHOD AND APPARATUS FOR IMPLEMENTING ELECTRONIC CASH," and U.S. Pat. No. 4,305,059, entitled "MODULAR FUNDS TRANSFER SYSTEM."

5 The more well known techniques include magnetic stripe cards purchased for a given amount and from which a prepaid value can be deducted for specific purposes. Upon exhaustion of the economic value, the cards are thrown away. Other examples include memory cards or so called smart cards which are capable of repetitively

10 storing information representing value that is likewise deducted for specific purposes.

It is desirable for a computer operated under the control of a merchant to obtain information offered by a customer and transmitted by a computer operating under

15 the control of the customer over a publicly accessible packet-switched network (e.g., the Internet) to the computer operating under the control of the merchant, without risking the exposure of the information to interception by third parties that have access to the network, and to assure that the information is from an authentic source. It is further desirable for the merchant to transmit information, including a

20 subset of the information provided by the customer, over such a network to a payment gateway computer system that is designated, by a bank or other financial institution that has the responsibility of providing payment on behalf of the customer, to authorize a commercial transaction on behalf of such a financial institution, without the risk of exposing that information to interception by third

25 parties. Such institutions include, for example, financial institutions offering credit or debit card services.

One such attempt to provide such a secure transmission channel is a secure payment technology such as Secure Electronic Transaction (hereinafter "SET"),

30 jointly developed by the Visa and MasterCard card associations, and described in Visa and MasterCard's *Secure Electronic Transaction (SET) Specification*, February 23, 1996, hereby incorporated by reference. Other such secure payment technologies include Secure Transaction Technology ("STT"), Secure Electronic Payments Protocol ("SEPP"), Internet Keyed Payments ("iKP"), Net Trust, and Cybercash Credit Payment

35 Protocol. One of ordinary skill in the art readily comprehends that any of the secure payment technologies can be substituted for the SET protocol without undue experimentation. Such secure payment technologies require the customer to operate

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software that is compliant with the secure payment technology, interacting with third-party certification authorities, thereby allowing the customer to transmit encoded information to a merchant, some of which may be decoded by the merchant, and some which can be decoded only by a payment gateway specified by the customer.

Another such attempt to provide such a secure transmission channel is a general-purpose secure communication protocol such as Netscape, Inc.'s Secure Sockets Layer (hereinafter "SSL") , as described in Freier, Karlton & Kocher (hereinafter "Freier"), *The SSL Protocol Version 3.0*, March 1996, and hereby incorporated by reference. SSL provides a means for secure transmission between two computers. SSL has the advantage that it does not require special-purpose software to be installed on the customer's computer because it is already incorporated into widely available software that many people utilize as their standard Internet access medium, and does not require that the customer interact with any third-party certification authority. Instead, the support for SSL may be incorporated into software already in use by the customer, e.g., the Netscape Navigator World Wide Web browsing tool. However, although a computer on an SSL connection may initiate a second SSL connection to another computer, a drawback to the SSL approach is each SSL connection supports only a two-computer connection. Therefore, SSL does not provide a mechanism for transmitting encoded information to a merchant for retransmission to a payment gateway such that a subset of the information is readable to the payment gateway but not to the merchant. Although SSL allows for robustly secure two-party data transmission, it does not meet the ultimate need of the electronic commerce market for robustly secure three-party data transmission. Other examples of general-purpose secure communication protocols include Private Communications Technology ("PCT") from Microsoft, Inc., Secure Hyper-Text Transport Protocol ("SHTTP") from Terisa Systems, Shen, Kerberos, Photuris, Pretty Good Privacy ("PGP") which meets the IPSEC criteria. One of ordinary skill in the art readily comprehends that any of the general-purpose secure communication protocols can be substituted for the SSL transmission protocol without undue experimentation.

Banks desire an Internet payment solution that emulates existing Point of Sale (POS) applications that are currently installed on their host computers, and require minimal changes to their host systems. This is a critical requirement since any downtime for a banks host computer system represents an enormous expense.

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Currently, VeriFone supports over fourteen hundred different payment-related applications. The large number of applications is necessary to accommodate a wide variety of host message formats, diverse methods for communicating to a variety of hosts with different dial-up and direct-connect schemes, and different certification
5 around the world. In addition, there are a wide variety of business processes that dictate how a Point of Sale (POS) terminal queries a user for data and subsequently displays the data. Also, various vertical market segments, such as hotels, car rental agencies, restaurants, retail sales, mail sales / telephone sales require interfaces for different types of data to be entered, and provide different discount rates to
10 merchants for complying with various data types. Moreover, a plethora of report generation mechanisms and formats are utilized by merchants that banking organizations work with.

Banks are unwilling to converge on "standards" since convergence would facilitate
15 switching from one acquiring bank to another by merchants. In general, banks desire to increase the cost that a merchant incurs in switching from one acquiring bank to another acquiring bank. This is accomplished by supplying a merchant with a terminal that only communicates utilizing the bank's proprietary protocol, and by providing other value-added services that a merchant may not be able to
20 obtain at another bank.

Internet-based payment solutions require additional security measures that are not found in conventional POS terminals. This additional requirement is necessitated because Internet communication is done over publicly-accessible, unsecured
25 communication line in stark contrast to the private, secure, dedicated phone or leased line service utilized between a traditional merchant and an acquiring bank. Thus, it is critical that any solution utilizing the Internet for a communication backbone, employ some form of cryptography.

30 As discussed above, the current state-of-the-art in Internet based payment processing is a protocol referred to as SET. Since the SET messages are uniform across all implementations, banks cannot differentiate themselves in any reasonable way. Also, since SET is not a proper superset of all protocols utilized today, there are bank protocols which cannot be mapped or translated into SET because they
35 require data elements for which SET has no placeholder. Further, SET only handles the message types directly related to authorizing and capturing credit card transactions and adjustments to these authorizations or captures. In a typical POS

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terminal in the physical world, these messages comprise almost the entire volume of the total number of messages between the merchant and the authorizing bank, but only half of the total number of different message types. These message types, which are used infrequently, but which are critical to the operation of the POS terminal must be supported for proper transaction processing.

SUMMARY OF THE INVENTION

According to a broad aspect of a preferred embodiment of the invention, communication networks that employ transactions between applications must effectively manage transactions that flow over the network. In addition, networking systems must also detect counterfeit transactions, especially, when the networking systems are utilized for financial transactions. An active, on-line database is utilized as a transaction log to track original requests, valid retries and detect fraudulent transactions. The transaction log serves as a memory cache where the received host response is returned to a valid retry transaction should the original response fail to reach a server because of a communications problem.

DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages are better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

- 5 Figure **1A** is a block diagram of a representative hardware environment in accordance with a preferred embodiment;
 Figure **1B** depicts an overview in accordance with a preferred embodiment;
 Figure **1C** is a block diagram of the system in accordance with a preferred embodiment;
- 10 Figure **2** depicts a more detailed view of a customer computer system in communication with merchant system under the Secure Sockets Layer protocol in accordance with a preferred embodiment;
 Figure **3** depicts an overview of the method of securely supplying payment information to a payment gateway in order to obtain payment authorization in
15 accordance with a preferred embodiment;
 Figure **4** depicts the detailed steps of generating and transmitting a payment authorization request in accordance with a preferred embodiment;
 Figures **5A** through **5F** depict views of the payment authorization request and its component parts in accordance with a preferred embodiment;
- 20 Figures **6A** and **6B** depict the detailed steps of processing a payment authorization request and generating and transmitting a payment authorization request response in accordance with a preferred embodiment;
 Figures **7A** through **7J** depict views of the payment authorization response and its component parts in accordance with a preferred embodiment;
- 25 Figure **8** depicts the detailed steps of processing a payment authorization response in accordance with a preferred embodiment;
 Figure **9** depicts an overview of the method of securely supplying payment capture information to a payment gateway in accordance with a preferred embodiment;
 Figure **10** depicts the detailed steps of generating and transmitting a payment
30 capture request in accordance with a preferred embodiment;
 Figures **11A** through **11F** depict views of the payment capture request and its component parts in accordance with a preferred embodiment;
 Figures **12A** and **12B** depict the detailed steps of processing a payment capture request and generating and transmitting a payment capture request response in
35 accordance with a preferred embodiment;
 Figures **13A** through **13F** depict views of the payment capture response and its component parts in accordance with a preferred embodiment;

Figure 14 depicts the detailed steps of processing a payment capture response in accordance with a preferred embodiment;

Figure 15A & 15B depicts transaction processing of merchant and consumer transactions in accordance with a preferred embodiment;

5 Figure 16 illustrates a transaction class hierarchy block diagram in accordance with a preferred embodiment;

Figure 17 shows a typical message flow between the merchant, vPOS terminal and the Gateway in accordance with a preferred embodiment;

10 Figures 18A-E are block diagrams of the extended SET architecture in accordance with a preferred embodiment;

Figure 19 is a flowchart of vPOS merchant pay customization in accordance with a preferred embodiment;

Figures 20A-20H are block diagrams and flowcharts setting forth the detailed logic of thread processing in accordance with a preferred embodiment;

15 Figure 21 is a detailed diagram of a multithreaded gateway engine in accordance with a preferred embodiment;

Figure 22 is a flow diagram in accordance with a preferred embodiment;

Figure 23 illustrates a Gateway's role in a network in accordance with a preferred embodiment;

20 Figure 24 is a block diagram of the Gateway in accordance with a preferred embodiment;

Figure 25 is a block diagram of the vPOS Terminal Architecture in accordance with a preferred embodiment;

25 Figure 26 is an architecture block diagram in accordance with a preferred embodiment;

Figure 27 is a block diagram of the payment manager architecture in accordance with a preferred embodiment;

Figure 28 is a Consumer Payment Message Sequence Diagram in accordance with a preferred embodiment of the invention;

30 Figure 29 is an illustration of a certificate issuance form in accordance with a preferred embodiment;

Figure 30 illustrates a certificate issuance response in accordance with a preferred embodiment;

35 Figure 31 illustrates a collection of payment instrument holders in accordance with a preferred embodiment;

Figure 32 illustrates the default payment instrument bitmap in accordance with a preferred embodiment;

- Figure 33 illustrates a selected payment instrument with a fill in the blanks for the cardholder in accordance with a preferred embodiment;
- Figure 34 illustrates a coffee purchase utilizing the newly defined VISA card in accordance with a preferred embodiment of the invention;
- 5 Figure 35 is a flowchart of conditional authorization of payment in accordance with a preferred embodiment;
- Figures 36-48 are screen displays in accordance with a preferred embodiment;
- Figure 49 shows how the vPOS authenticates an incoming response to a request in accordance with a preferred embodiment;
- 10 Figure 50 is a flowchart for the merchant interaction with the Test Gateway in accordance with a preferred embodiment;
- Figures 51-61 are flowcharts depicting the detailed logic of the gateway in accordance with a preferred embodiment;
- Figure 62 is the main administration display for the Gateway in accordance with a preferred embodiment;
- 15 Figure 63 is a configuration panel in accordance with a preferred embodiment.
- Figure 64 is a host communication display for facilitating communication between the gateway and the acquirer payment host in accordance with a preferred embodiment;
- 20 Figure 65 is a Services display in accordance with a preferred embodiment; and
- Figure 66 is a graphical representation of the gateway transaction database in accordance with a preferred embodiment.

DETAILED DESCRIPTION

- 25 A preferred embodiment of a system in accordance with the present invention is preferably practiced in the context of a personal computer such as the IBM PS/2, Apple Macintosh computer or UNIX based workstation. A representative hardware environment is depicted in Figure 1A, which illustrates a typical hardware
- 30 configuration of a workstation in accordance with a preferred embodiment having a central processing unit 10, such as a microprocessor, and a number of other units interconnected via a system bus 12. The workstation shown in Figure 1A includes a Random Access Memory (RAM) 14, Read Only Memory (ROM) 16, an I/O adapter 18 for connecting peripheral devices such as disk storage units 20 to the bus 12, a user interface adapter 22 for connecting a keyboard 24, a mouse 26, a speaker 28, a
- 35 microphone 32, and/or other user interface devices such as a touch screen (not shown) to the bus 12, communication adapter 34 for connecting the workstation to a communication network (e.g., a data processing network) and a display adapter 36

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for connecting the bus 12 to a display device 38. The workstation typically has resident thereon an operating system such as the Microsoft Windows NT or Windows/95 Operating System (OS), the IBM OS/2 operating system, the MAC OS, or UNIX operating system. Those skilled in the art will appreciate that the present invention may also be implemented on platforms and operating systems other than those mentioned.

A preferred embodiment is written using JAVA, C, and the C++ language and utilizes object oriented programming methodology. Object oriented programming (OOP) has become increasingly used to develop complex applications. As OOP moves toward the mainstream of software design and development, various software solutions require adaptation to make use of the benefits of OOP. A need exists for these principles of OOP to be applied to a messaging interface of an electronic messaging system such that a set of OOP classes and objects for the messaging interface can be provided.

Thus, as object-oriented programming solutions are applied to various problems and programming tasks, significant reductions in the design and development effort for software can be achieved. A preferred embodiment of the invention utilizes HyperText Markup Language (HTML) to implement documents on the Internet together with a general-purpose secure communication protocol for a transport medium between the client and the merchant. HTTP or other protocols could be readily substituted for HTML without undue experimentation. Information on these products is available in T. Berners-Lee, D. Connolly, "RFC 1866: Hypertext Markup Language - 2.0" (Nov. 1995); and R. Fielding, H. Frystyk, T. Berners-Lee, J. Gettys and J.C. Mogul, "Hypertext Transfer Protocol -- HTTP/1.1: HTTP Working Group Internet Draft" (May 2, 1996). HTML is a simple data format used to create hypertext documents that are portable from one platform to another. HTML documents are SGML documents with generic semantics that are appropriate for representing information from a wide range of domains. HTML has been in use by the World-Wide Web global information initiative since 1990. HTML is an application of ISO Standard 8879:1986 Information Processing Text and Office Systems; Standard Generalized Markup Language (SGML). Sun's JAVA allows developers to create robust User Interface (UI) components. Custom "widgets" (e.g. real-time stock tickers, animated icons, etc.) can be created, and client-side performance is improved. Unlike HTML, Java supports the notion of client-side validation, offloading appropriate processing onto the client for improved performance.

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Dynamic, real-time Web pages can be created. Using the above-mentioned custom UI components, dynamic Web pages can also be created.

Sun's Java language has emerged as an industry-recognized language for "programming the Internet." Sun defines Java as: "a simple, object-oriented, distributed, interpreted, robust, secure, architecture-neutral, portable, high-performance, multithreaded, dynamic, buzzword-compliant, general-purpose programming language. Java supports programming for the Internet in the form of platform-independent Java applets." Java applets are small, specialized applications that comply with Sun's Java Application Programming Interface (API) allowing developers to add "interactive content" to Web documents (e.g. simple animations, page adornments, basic games, etc.). Applets execute within a Java-compatible browser (e.g. Netscape Navigator) by copying code from the server to client. From a language standpoint, Java's core feature set is based on C++. Sun's Java literature states that Java is basically "C++, with extensions from Objective C for more dynamic method resolution". Another technology that provides similar function to JAVA is provided by Microsoft and ActiveX Technologies, to give developers and Web designers wherewithal to build dynamic content for the Internet and personal computers. ActiveX includes tools for developing animation, 3-D virtual reality, video and other multimedia content. The tools use Internet standards, work on multiple platforms, and are being supported by over 100 companies. The group's building blocks are called ActiveX Controls, small, fast components that enable developers to embed parts of software in hypertext markup language (HTML) pages. ActiveX Controls work with a variety of programming languages including Microsoft Visual C++, Borland Delphi, Microsoft Visual Basic programming system and, in the future, Microsoft's development tool for Java, code named "Jakarta." ActiveX Technologies also includes ActiveX Server Framework, allowing developers to create server applications. One of ordinary skill in the art readily recognizes that ActiveX could be substituted for JAVA without undue experimentation to practice the invention. Figure 1B depicts an overview of the present invention. Customer computer system 120 is in communication with merchant computer system 130. The customer-merchant session 150 operates under a general-purpose secure communication protocol such as the SSL protocol. Merchant computer system 130 is additionally in communication with payment gateway computer system 140. A payment gateway is a system that provides electronic commerce services in support of a bank or other financial institution, and that interfaces to the financial institution to support the authorization and capture of transactions. The customer-institution session 170

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operates under a variant of a secure payment technology such as the SET protocol, as described herein, referred to as Merchant-Originated Secure Electronic Transactions ("MOSET"), as is more fully described herein.

5

Customer-to-Merchant Communication

Figure 2 depicts a more detailed view of customer computer system 120 in communication with merchant system 130 using customer-merchant session 150 operating under the SSL protocol as documented in Freier and incorporated by reference. Customer computer system 120 initiates communication with merchant computer system 130 using any well-known access protocol, e.g., Transmission Control Protocol/Internet Protocol ("TCP/IP"). A description of TCP/IP is provided in Information Sciences Institute, "Transmission Control Protocol DARPA Internet Program Protocol Specification (RFC 793)" (September, 1981), and Information Sciences Institute, "Internet Protocol DARPA Internet Program Protocol Specification (RFC 791)" (September, 1981). In this implementation, customer computer system 120 acts as a client and merchant computer system 130 acts as a server.

Customer computer system 120 initiates communication by sending "client hello" message 210 to the merchant computer system 130. When a client first connects to a server it is required to send the client hello message 210 as its first message. The client can also send a client hello message 210 in response to a hello request on its own initiative in order to renegotiate the security parameters in an existing connection. The client hello message includes a random structure, which is used later in the protocol. Specifically, the random structure includes the current time and date in standard UNIX 32-bit format according to the sender's internal clock and twenty-eight bytes of data generated by a secure random number generator. The client hello message 210 further includes a variable length session identifier. If not empty, the session identifier value identifies a session between the same client and server whose security parameters the client wishes to reuse. The session identifier may be from an earlier connection, the current connection, or another currently active connection. It is useful to specify the current connection if the client only wishes to update the random structures and derived values of a connection. It is useful to specify another currently active connection if the client wishes to establish several simultaneous independent secure connections to the same server without repeating the full handshake protocol. Client hello message 210 further includes an indicator of the cryptographic algorithms supported by the client in order of the client's preference, ordered according to client preference.

In response to client hello message **210**, if merchant computer system **130** wishes to correspond with customer computer system **120**, it responds with server hello message **215**. If merchant computer system **130** does not wish to communicate
5 with customer computer system **120**, it responds with a message, not shown, indicating refusal to communication. Server hello message **215** includes a random structure, which is used later in the protocol. The random structure in server hello message **215** is in the same format as, but has contents independent of, the random structure in client hello message **210**. Specifically, the random structure includes
10 the current time and date in standard UNIX 32-bit format according to the sender's internal clock and twenty-eight bytes of data generated by a secure random number generator. Server hello message **215** further includes a variable length session identifier. The session identifier value identifies a new or existing session between the same client and server. Server hello message **215** further includes an indicator
15 of the cryptographic algorithms selected from among the algorithms specified by client hello message **210**, which is utilized in further encrypted communications.

Optionally, Merchant computer system **130** transmits a server certificate **220**. If transmitted, server certificate **130** enables customer computer system **120** to
20 authenticate the identity of merchant computer system **130**. If merchant computer system **130** does not transmit a server certificate **220**, or if server certificate **220** is suitable only for authentication, it may optionally transmit a server key exchange message **225**. Server key exchange message **225** identifies a key that may be used by customer computer system **120** to decrypt further messages sent by merchant
25 computer system **130**. After transmitting server hello message **215**, and optionally transmitting server certificate **220** or server key exchange message **225**, merchant computer system **130** transmits a server hello done message **230** and waits for a further response from customer computer system **120**.

30 Customer computer system **120** optionally transmits client certificate **240** to merchant computer system **130**. If transmitted, client certificate **240** enables merchant computer system **130** to authenticate the identity of customer computer system **120**. Alternatively, customer computer system **120** may transmit a no-client-certificate alert **245**, to indicate that the customer has not registered with any
35 certification authority. If customer computer system **130** does not transmit a client certificate **240**, or if client certificate **240** is suitable only for authentication, customer computer system **130** may optionally transmit a client key exchange

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message **250**. Client key exchange message **250** identifies a key that may be used by merchant computer system **130** to decrypt further messages sent by customer computer system **120**. After optionally transmitting client certificate **240**, no-client-certificate alert **245**, and/or client key exchange message **250**, customer computer system **120** transmits a finished message **260**.

At this point, customer computer system **120** and merchant computer system **130** have:

- 1) negotiated an encryption scheme that may be commonly employed in further communications, and
- 2) have communicated to each other a set of encryption keys that may be used to decrypt further communications between the two computer systems.

Customer computer system **120** and merchant computer system **130** may thereafter engage in secure communications **270** with less risk of interception by third parties. Among the messages communicated by customer computer system **120** to merchant computer system **130** may be messages that specify goods or services to be ordered and payment information, such as a credit card number and related information, collectively referred to as "payment information," that may be used to pay for the goods and/or services ordered. In order to obtain payment, the merchant must supply this information to the bank or other payment gateway responsible for the proffered payment method. This enables the merchant to perform payment authorization and payment capture. Payment authorization is the process by which permission is granted by a payment gateway operating on behalf of a financial institution to authorize payment on behalf of the financial institution. This is a process that assesses transaction risk, confirms that a given transaction does not raise the account holder's debt above the account's credit limit, and reserves the specified amount of credit. Payment capture is the process that triggers the movement of funds from the financial institution to the merchant's account after settlement of the account.

Payment Authorization

Merchants utilize point-of-sale products for credit and debit transactions on a daily basis. An embodiment in accordance with the subject invention allows an acquirer processor to accept transactions from Internet storefronts without altering a current host environment.

The system easily converts payment protocol messages and simultaneously manages transactions from a number of Internet merchant servers. As the number of transactions grows, the payment gateway can be scaled to handle the increased business, and it can be configured to work with specific business processes used by the acquirer/processor. Thus, the payment gateway supports Internet processing utilizing payment processing operations.

The payment gateway provides support for configuring and installing the Internet payment capability utilizing existing host point-of-sale technology. The payment gateway also provides an intuitive Graphical User Interface (GUI) with support built in to accommodate future payment instruments such as debit cards, electronic checks, electronic cash and micropayments. The payment gateway implements secure transactions using RSA public-key cryptography and the MasterCard/Visa Secure Electronic Transaction (SET) protocol. The gateway also provides full functionality for merchant payment processing including authorization, capture, settlement and reconciliation while providing monitor activity with reporting and tracking of transactions sent over the Internet. Finally, the payment gateway also implements Internet payment procedures that match current processor business models to ensure consistency for merchants. Handling Internet transactions is destined to become a necessary function for every payment processing system. Today, merchants often transmit data received over the Internet inefficiently. Some fax the information or waste time keying data into a non-Internet system.

Figure 3 depicts an overview of the method of securely supplying payment information to a payment gateway in order to obtain payment authorization. In function block 310, merchant computer system 130 generates a payment authorization request 315 and transmits it to payment gateway computer system 140. In function block 330, payment gateway system 140 processes the payment authorization request, generates a payment authorization response 325 and transmits it to merchant computer system 130. In function block 320, merchant computer system 130 processes payment authorization response 325 and determines whether payment for the goods or services sought to be obtained by the customer has been authorized.

Payment Authorization Request Generation

Figure 4 depicts the detailed steps of generating and transmitting a payment authorization request. Figures 5A through 5F depict views of the payment

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authorization request and its component parts. In function block **410**, merchant computer system **130** creates a basic authorization request **510**. The basic authorization request is a data area that includes all the information for determining whether a request should be granted or denied. Specifically, it includes such information as the party who is being charged, the amount to be charged, the account number of the account to be charged, and any additional data, such as passwords, needed to validate the charge. This information is either calculated based upon prior customer merchandise selection, or provided by the customer over the secure link **270** established in the customer-merchant general-purpose secure communication protocol session. Fig **5A** depicts a basic authorization request **510**.

In function block **420**, merchant computer system **130** combines basic authorization request **510**, a copy of its encryption public key certificate **515** and a copy of its signature public key certificate **520**. Merchant computer system **130** calculates a digital signature **525** for the combined contents of the combined block **530** comprising basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**, and appends it to the combination of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. The merchant computer system calculates digital signature **525** by first calculating a "message digest" based upon the contents of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. A message digest is the fixed-length result that is generated when a variable length message is fed into a one-way hashing function. Message digests help verify that a message has not been altered because altering the message would change the digest. The message digest is then encrypted using the merchant computer system's **130** digital signature private key, thus forming a digital signature.

Figure **5B** depicts the combined block **530** formed by function block **420** and containing basic authorization request **510**, the encryption public key certificate **515**, the signature public key certificate **520**, and digital signature **525**. In function block **430**, merchant computer system **130** generates a random encryption key RK-0 **540**, denoted as RK-0. Random encryption key RK-0 **540** is a symmetric encryption key. A symmetric encryption key is a key characterized by the property that a message encrypted with a symmetric key can be decrypted with that same key. This is contrasted with an asymmetric key pair, such as a public-key/private-key key pair, where a message encrypted with one key of the key pair may only be decrypted

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with the other key of the same key pair. Figure 5C depicts random encryption key RK-0 540.

5 In function block 440, merchant computer system 130 encrypts combined block 530 using random encryption key RK-0 540 to form encrypted combined block 550. Figure 5D depicts encrypted combined block 550. The encryption state of encrypted combined block 550 is graphically shown by random key lock 555, which indicates that encrypted combined block 550 is encrypted using random key RK-0 540. In function block 450, merchant computer system 130 encrypts random encryption
10 key RK-0 540 using the public key of payment gateway system 140 to form encrypted random key 560. Figure 5E depicts encrypted random key 560. The encryption state of encrypted random key 560 is graphically shown by payment gateway public key lock 565, which indicates that encrypted random key 560 is encrypted using the payment gateway public key. In function block 460, merchant
15 computer system 130 concatenates encrypted combined block 550 and encrypted random key 560 to form merchant authorization request 315. Figure 5F depicts merchant authorization request 315 comprising encrypted combined block 550 and encrypted random key 560. In function block 470, merchant computer system 130 transmits merchant authorization request 315 to payment gateway system 140.

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Payment Authorization Request Processing

Figure 6 depicts the detailed steps of processing a payment authorization request and generating and transmitting a payment authorization request response. Function blocks 610 through 630 depict the steps of processing a payment
25 authorization request, while function blocks 635 through 685 depict the steps of generating and transmitting a payment authorization request response. In function block 610, payment gateway computer system 140 applies its private key to encrypted random key 560 contained within received merchant authorization request 315, thereby decrypting it and obtaining a cleartext version of random key
30 RK-0 540. In function block 615, payment gateway computer system 140 applies random key RK-0 540 to encrypted combined block 550, thereby decrypting it and obtaining a cleartext version of combined block 530. Combined block 530 comprises basic authorization request 510, a copy of merchant computer system's 130 encryption public key certificate 515 and a copy of merchant computer system's
35 130 signature public key certificate 520, as well as merchant digital signature 525.

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In function block **620**, payment gateway computer system **140** verifies merchant computer system's **130** encryption public key certificate **515** and merchant computer system's **130** signature public key certificate **520**. Payment gateway computer system **140** performs this verification by making a call to the certification authorities associated with each certificate. If verification of either certificate fails, payment gateway computer system **140** rejects the authorization request. In function block **625**, payment gateway computer system **140** validates merchant digital signature **525**. Payment gateway computer system **140** performs this validation by calculating a message digest over the contents of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. Payment gateway computer system **140** then decrypts digital signature **525** to obtain a copy of the equivalent message digest calculated by merchant computer system **130** in function block **420**. If the two message digests are equal, the digital signature **525** is validated. If validation fails, payment gateway computer system **140** rejects the authorization request. In function block **630**, payment gateway computer system **140** determines the financial institution for which authorization is required by inspection of basic authorization request **510**. Payment gateway computer system **140** contacts the appropriate financial institution using a secure means, e.g, a direct-dial modem-to-modem connection, or a proprietary internal network that is not accessible to third parties, and using prior art means, obtains a response indicating whether the requested payment is authorized.

Payment Authorization Response Generation

Function blocks **635** through **685** depict the steps of generating and transmitting a payment authorization request response. Figures **7A** through **7J** depict views of the payment authorization response and its component parts. In function block **635**, payment gateway computer system **140** creates a basic authorization response **710**. The basic authorization request is a data area that includes all the information to determine whether a request was granted or denied. Figure **7A** depicts basic authorization response **710**. In function block **640**, payment gateway computer system **140** combines basic authorization response **710**, and a copy of its signature public key certificate **720**. Payment computer system **140** calculates a digital signature **725** for the combined contents of the combined block **730** comprising basic authorization response **710** and the signature public key certificate **720**, and appends the signature to the combination of the combined basic authorization response **710** and the signature public key certificate **720**. The payment gateway

computer system calculates digital signature **725** by first calculating a message digest based on the contents of the combined basic authorization response **710** and signature public key certificate **720**. The message digest is then encrypted using the merchant computer system's **140** digital signature private key, thus forming a
5 digital signature.

Figure **7B** depicts the combined block **730** formed in function block **640** and containing basic authorization response **710**, the signature public key certificate **720**, and digital signature **725**. In function block **645**, payment gateway computer
10 system **150** generates a first symmetric random encryption key **740**, denoted as RK-1. Figure **7C** depicts first random encryption key RK-1 **740**. In function block **650**, payment gateway computer system **140** encrypts combined block **730** using random encryption key RK-1 **740** to form encrypted combined block **750**. Figure **7D** depicts encrypted combined block **750**. The encryption state of encrypted combined block
15 **750** is graphically shown by random key lock **755**, which indicates that encrypted combined block **750** is encrypted using random key RK-1 **740**. In function block **655**, payment gateway computer system **140** encrypts random encryption key RK-1 **740** using the public key of merchant computer system **130** to form encrypted random key RK **760**. Figure **7E** depicts encrypted random key RK-1 **760**. The
20 encryption state of encrypted random key **760** is graphically shown by merchant public key lock **765**, which indicates that encrypted random key **760** is encrypted using the merchant public key. In function block **660**, payment gateway computer system **140** generates a random capture token **770**. Random capture token **770** is utilized in subsequent payment capture processing to associate the payment capture
25 request with the payment authorization request being processed. Figure **7F** depicts capture token **775**. In function block **665**, payment gateway computer system **140** generates a second symmetric random encryption key **775**, denoted as RK-2. Figure **7G** depicts second random encryption key RK-2 **775**. In function block **670**, payment gateway computer system **140** encrypts capture token **770** using random encryption key RK-2 **770** to form encrypted capture token **780**. Figure **7H** depicts encrypted capture token **780**. The encryption state of encrypted capture token **780**
30 is graphically shown by random key lock **785**, which indicates that encrypted capture token **780** is encrypted using random key RK-2 **770**. In function block **675**, payment gateway computer system **140** encrypts second random encryption key RK-2 **775** using its own public key to form encrypted random key RK-2 **790**. Figure **7I** depicts encrypted random key RK-2 **790**. The encryption state of encrypted random key **790** is graphically shown by payment gateway public key lock **795**, which
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indicates that encrypted random key **790** is encrypted using the payment gateway public key. In function block **680**, payment gateway computer system **140** concatenates encrypted combined block **750**, encrypted random key RK-1 **760**, encrypted capture token **780** and encrypted random key RK-2 **790** to form merchant authorization response **325**. Figure **7J** depicts merchant authorization response **325** comprising encrypted combined block **750**, encrypted random key RK-1 **760**, encrypted capture token **780** and encrypted random key RK-2 **790**. In function block **685**, payment gateway computer system **140** transmits merchant authorization response **325** to merchant system **130**.

Payment Authorization Response Processing

Figure **8** depicts the detailed steps of processing a payment authorization response. In function block **810**, merchant computer system **130** applies its private key to encrypted random key RK-1 **760** contained within received merchant authorization response **325**, thereby decrypting it and obtaining a cleartext version of random key RK-1 **740**. In function block **820**, merchant computer system **130** applies random key RK-1 **740** to encrypted combined block **750**, thereby decrypting it and obtaining a cleartext version of combined block **730**. Combined block **730** comprises basic authorization response **710**, a copy of payment gateway computer system's **140** signature public key certificate **720**, as well as payment gateway digital signature **725**. In function block **830**, merchant computer system **130** verifies payment gateway computer system's **140** signature public key certificate **720**. Merchant computer system **130** performs this verification by making a call to the certification authority associated with the certificate. If verification of the certificate fails, merchant computer system **130** concludes that the authorization response is counterfeit and treats it though the authorization request had been rejected. In function block **840**, merchant computer system **130** validates payment gateway digital signature **725**. Merchant computer system **130** performs this validation by calculating a message digest over the contents of the combined basic authorization request **710** and the signature public key certificate **720**. Merchant computer system **130** then decrypts digital signature **725** to obtain a copy of the equivalent message digest calculated by payment gateway computer system **140** in function block **640**. If the two message digests are equal, the digital signature **725** is validated. If validation fails, concludes that the authorization response is counterfeit and treats it though the authorization request had been rejected. In function block **850**, merchant computer system **130** stores encrypted capture token **780** and encrypted random key RK-2 **790** for later use in payment capture. In function block

860, merchant computer system 130 processes the customer purchase request in accordance with the authorization response 710. If the authorization response indicates that payment is authorized, merchant computer system 130 fills the requested order. If the authorization response indicates that payment is not
5 authorized, or if merchant computer system 130 determined in function block 830 or 840 that the authorization response is counterfeit, merchant computer system 130 indicates to the customer that the order cannot be filled.

Payment Capture

10 Figure 9 depicts an overview of the method of securely supplying payment capture information to payment gateway 140 in order to obtain payment capture. In function block 910, merchant computer system 130 generates a merchant payment capture request 915 and transmits it to payment gateway computer system 140. In function block 930, payment gateway system 140 processes the payment capture
15 request 915, generates a payment capture response 925 and transmits it to merchant computer system 130. In function block 920, merchant computer system 130 processes payment capture response 925 and verifies that payment for the goods or services sought to be obtained by the customer have been captured.

Payment Capture Request Generation

20 Figure 10 depicts the detailed steps of generating and transmitting a payment capture request. Figures 11A through 11F depict views of the payment capture request and its component parts. In function block 1010, merchant computer system 130 creates a basic capture request 510. The basic capture request is a
25 data area that includes all the information needed by payment gateway computer system 140 to trigger a transfer of funds to the merchant operating merchant computer system 130. Specifically, a capture request includes a capture request amount, a capture token, a date, summary information of the purchased items and a Merchant ID (MID) for the particular merchant. Figure 11A depicts basic
30 authorization request 1110. In function block 1020, merchant computer system 130 combines basic capture request 1110, a copy of its encryption public key certificate 1115 and a copy of its signature public key certificate 1120. Merchant computer system 130 calculates a digital signature 1125 for the combined contents of the combined block 1130 comprising basic capture request 1110, the encryption
35 public key certificate 1115 and the signature public key certificate 1120, and appends it to the combination of the combined basic capture request 1110, the encryption public key certificate 1115 and the signature public key certificate 1120.

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The merchant computer system calculates digital signature **1125** by first calculating a message digest over the contents of the combined basic capture request **1110**, the encryption public key certificate **1115** and the signature public key certificate **1120**. The message digest is then encrypted using the merchant computer system's **130** digital signature private key, thus forming a digital signature.

Figure **11B** depicts the combined block **1130** formed by function block **1020** and containing basic capture request **1110**, the encryption public key certificate **1115**, the signature public key certificate **1120**, and digital signature **1125**. In function block **1030**, merchant computer system **130** generates a random encryption key **1140**, denoted as RK-3. Random encryption key RK-3 **1140** is a symmetric encryption key. Figure **11C** depicts random encryption key RK-3 **1140**. In function block **1040**, merchant computer system **130** encrypts combined block **1130** using random encryption key RK-3 **1140** to form encrypted combined block **1150**. Figure **11D** depicts encrypted combined block **1150**. The encryption state of encrypted combined block **1150** is graphically shown by random key lock **1155**, which indicates that encrypted combined block **1150** is encrypted using random key RK-3 **1140**. In function block **1050**, merchant computer system **130** encrypts random encryption key RK-3 **1140** using the public key of payment gateway system **140** to form encrypted random key **1160**. Figure **11E** depicts encrypted random key **1160**. The encryption state of encrypted random key **1160** is graphically shown by payment gateway public key lock **1165**, which indicates that encrypted random key RK-3 **1160** is encrypted using the payment gateway public key. In function block **1060**, merchant computer system **130** concatenates encrypted combined block **1150**, encrypted random key **1160**, and the encrypted capture token **780** and encrypted random key RK-2 **790** that were stored in function block **850** to form merchant capture request **915**. Figure **11F** depicts merchant capture request **915**, comprising encrypted combined block **1150**, encrypted random key **1160**, encrypted capture token **780** and encrypted random key RK-2 **790**. In function block **1070**, merchant computer system **130** transmits merchant capture request **915** to payment gateway system **140**.

Payment Capture Request Processing

Figure **12** depicts the detailed steps of processing a payment capture request and generating and transmitting a payment capture request response. Function blocks **1210** through **1245** depict the steps of processing a payment capture request, while function blocks **1250** through **1285** depict the steps of generating and transmitting

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a payment capture request response. In function block **1210**, payment gateway computer system **140** applies its private key to encrypted random key **1160** contained within received merchant capture request **915**, thereby decrypting it and obtaining a cleartext version of random key RK-3 **1140**. In function block **1215**,
5 payment gateway computer system **140** applies random key RK-3 **1140** to encrypted combined block **1150**, thereby decrypting it and obtaining a cleartext version of combined block **1130**. Combined block **1130** comprises basic capture request **1110**, a copy of merchant computer system's **130** encryption public key certificate **1115** and a copy of merchant computer system's **130** signature public key
10 certificate **1120**, as well as merchant digital signature **1125**. In function block **1220**, payment gateway computer system **140** verifies merchant computer system's **130** encryption public key certificate **1115** and merchant computer system's **130** signature public key certificate **1120**. Payment gateway computer system **140** performs this verification by making a call to the certification authorities associated
15 with each certificate. If verification of either certificate fails, payment gateway computer system **140** rejects the capture request. In function block **1225**, payment gateway computer system **140** validates merchant digital signature **1125**. Payment gateway computer system **140** performs this validation by calculating a message digest over the contents of the combined basic capture request **1110**, the encryption
20 public key certificate **1115** and the signature public key certificate **1120**. Payment gateway computer system **140** then decrypts digital signature **1125** to obtain a copy of the equivalent message digest calculated by merchant computer system **130** in function block **1020**. If the two message digests are equal, the digital signature **1125** is validated. If validation fails, payment gateway computer system **140** rejects
25 the capture request. In function block **1230**, payment gateway computer system **140** applies its private key to encrypted random key RK-2 **790** contained within received merchant capture request **915**, thereby decrypting it and obtaining a cleartext version of random key RK-2 **775**. In function block **1235**, payment gateway computer system **140** applies random key RK-2 **775** to encrypted capture
30 token **780**, thereby decrypting it and obtaining a cleartext version of capture token **770**. In function block **1240**, payment gateway computer system **140** verifies that a proper transaction is being transmitted between capture token **780** and capture request **1110**. A capture token contains data that the gateway generates at the time of authorization. When the authorization is approved, the encrypted capture token
35 is given to the merchant for storage. At the time of capture, the merchant returns the capture token to the gateway along with other information required for capture. Upon receipt of the capture token, the gateway compares a message made of the

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capture request data and the capture token data and transmits this information over a traditional credit/debit network. If an improperly formatted transaction is detected, payment gateway computer system **140** rejects the capture request. In function block **1245**, payment gateway computer system **140** determines the financial institution for which capture is requested by inspection of basic capture request **1110**. Payment gateway computer system **140** contacts the appropriate financial institution using a secure means, e.g, a direct-dial modem-to-modem connection, or a proprietary internal network that is not accessible to third parties, and using prior art means, instructs a computer at the financial institution to perform the requested funds transfer after settlement.

Payment Capture Response Generation

Function blocks **1250** through **1285** depict the steps of generating and transmitting a payment capture request response. Figures **13A** through **13F** depict views of the payment capture response and its component parts. In function block **1250**, payment gateway computer system **140** creates a basic capture response **710**. The basic capture request is a data area that includes all the information to indicate whether a capture request was granted or denied. Figure **13A** depicts basic authorization request **1310**. In function block **1255**, payment gateway computer system **140** combines basic capture response **1310**, and a copy of its signature public key certificate **1320**. Payment computer system **140** calculates a digital signature **1325** for the combined contents of the combined block **1330** comprising basic capture response **1310** and the signature public key certificate **1320**, and appends the signature to the combination of the combined basic authorization request **1310** and the signature public key certificate **1320**. The payment gateway computer system calculates digital signature **1325** by first calculating a message digest over the contents of the combined basic capture response **1310** and signature public key certificate **720**. The message digest is then encrypted using the merchant computer system's **140** digital signature private key, thus forming a digital signature.

Figure **13B** depicts the combined block **1330** formed by function block **1255** and containing basic capture request **1310**, the signature public key certificate **1320**, and digital signature **1325**. In function block **1260**, payment gateway computer system **140** generates a symmetric random encryption key **1340**, denoted as RK-4. Figure **13C** depicts random encryption key RK-4 **1340**. In function block **1275**, payment gateway computer system **140** encrypts combined block **1330** using

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random encryption key RK-4 1340 to form encrypted combined block 1350. Figure 13D depicts encrypted combined block 1350. The encryption state of encrypted combined block 1350 is graphically shown by random key lock 1355, which indicates that encrypted combined block 1350 is encrypted using random key RK-4 1340. In function block 1275, payment gateway computer system 140 encrypts random encryption key RK-4 1340 using the public key of merchant computer system 130 to form encrypted random key RK-4 1360. Figure 13E depicts encrypted random key RK-4 1360. The encryption state of encrypted random key 1360 is graphically shown by merchant public key lock 1365, which indicates that encrypted random key 1360 is encrypted using the merchant public key. In function block 1280, payment gateway computer system 140 concatenates encrypted combined block 1350 and encrypted random key RK-4 1360 to form merchant capture response 925. Figure 13F depicts merchant capture response 925 comprising encrypted combined block 1350 and encrypted random key RK-4 1360. In function block 1285, payment gateway computer system 140 transmits merchant capture response 925 to merchant system 130.

Payment Capture Response Processing

Figure 14 depicts the detailed steps of processing a payment capture response. In function block 1410, merchant computer system 130 applies its private key to encrypted random key RK-4 1360 contained within received merchant capture response 925, thereby decrypting it and obtaining a cleartext version of random key RK-4 1340. In function block 1420, merchant computer system 130 applies random key RK-4 1340 to encrypted combined block 1350, thereby decrypting it and obtaining a cleartext version of combined block 1330. Combined block 1330 comprises basic capture response 1310, a copy of payment gateway computer system's 140 signature public key certificate 1320, as well as payment gateway digital signature 1325. In function block 1430, merchant computer system 130 verifies payment gateway computer system's 140 signature public key certificate 1320. Merchant computer system 130 performs this verification by making a call to the certification authority associated with the certificate. If verification of the certificate fails, merchant computer system 130 concludes that the capture response is counterfeit and raises an error condition. In function block 1440, merchant computer system 130 validates payment gateway digital signature 1325. Merchant computer system 130 performs this validation by calculating a message digest over the contents of the combined basic authorization request 1310 and the signature public key certificate 1320. Merchant computer system 130 then decrypts digital

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signature 1325 to obtain a copy of the equivalent message digest calculated by payment gateway computer system 140 in function block 1255. If the two message digests are equal, the digital signature 1325 is validated. If validation fails, merchant computer system 130 concludes that the authorization response is counterfeit and raises an error condition. In function block 1450, merchant computer system 130 stores capture response for later use in by legacy system accounting programs, e.g. to perform reconciliation between the merchant operating merchant computer system 130 and the financial institution from whom payment was requested, thereby completing the transaction. The system of the present invention permits immediate deployment of a secure payment technology architecture such as the SET architecture without first establishing a public-key encryption infrastructure for use by consumers. It thereby permits immediate use of SET-compliant transaction processing without the need for consumers to migrate to SET-compliant application software.

VIRTUAL POINT OF SALE (vPOS) DETAILS

A Virtual Point of Sale (vPOS) Terminal Cartridge is described in accordance with a preferred embodiment. The vPOS Terminal Cartridge provides payment functionality similar to what a VeriFone PoS terminal ("gray box") provides for a merchant today, allowing a merchant to process payments securely using the Internet. It provides full payment functionality for a variety of payment instruments.

Payment Functionality

Figure 15A illustrates a payment processing flow in accordance with a preferred embodiment. The payment functionality provided by the vPOS terminal is divided into two main categories: "Merchant-Initiated" 1510 and "Consumer-Initiated" 1500. Some payment transactions require communication with the Acquirer Bank through the Gateway 1530. The normal flow of a transaction is via the vPOS Cartridge API 1512 to the vPOS C++ API 1514 into the payment protocol layer 1516 which is responsible for converting into the appropriate format for transmission to the Gateway for additional processing and forwarding to existing host payment authorization systems. Host legacy format refers to an existing authorization system for credit card approval currently utilized with the VeriFone Point of Sale (POS) gray terminals. The output from the payment protocol layer 1516 is transmitted to the authorization processing center via the gateway 1530. These transactions are referred to as "Online Transactions" or "Host Payments." The transactions that can be done locally by the merchant without having to communicate with the Acquirer Bank are referred to as "Local Functions and Transactions." To support different

types of payment instruments, the vPOS Terminal payment functionality is categorized as set forth below.

- 5 • **Host Payment Functionality:** These transactions require communication with the final host, either immediately or at a later stage. For example, an Online Authorization-Only transaction, when initiated, communicates with the host immediately. However, an Off-line Authorization-Only transaction is locally authorized by the vPOS terminal without having to communicate with the host, but at a later stage this off-line authorization transaction is sent to the host.
- 10 Within the Host Payment Functionality some transactions have an associated Payment Instrument, while others do not. These two kinds of transactions are:
 - **Host Financial Payment Functionality:** These transactions have a Payment Instrument (Credit Card, Debit Card, E-Cash, E-Check, etc.) associated with them. For example, the "Return" transaction, which is initiated upon returning
 - 15 a merchandise to the merchant.
 - **Host Administrative Payment Functionality:** These transactions do not require a payment instrument, and provide either administrative or inquiry functionality. Examples of these transactions are "Reconcile" or the "Batch Close."
 - 20 • **Local Functions and Transactions:** These transactions do not require communication with the host at any stage, and provide essential vPOS terminal administrative functionality. An example of this is the vPOS terminal configuration function, which is required to set up the vPOS terminal. Another example is the "vPOS Batch Review" function, which is required to review the
 - 25 different transactions in the vPOS Batch or the Transaction Log.

Payment Instruments

A preferred embodiment of a vPOS terminal supports various Payment Instruments. A consumer chooses a payment based on personal preferences. Some of the Payment Instruments supported include:

- 30 • Credit Cards
- Debit Cards
- Electronic Cash
- Electronic Checks
- Micro-Payments (electronic coin)
- 35 • Smart Cards

URL Table

The table below enumerates the URLs corresponding to the transactions supported by the vPOS Terminal Cartridge. Note that the GET method is allowed for all transactions; however, for transactions that either create or modify information on the merchant server, a GET request returns an HTML page from which the transaction is performed via a POST method.

Transaction	URL	POST	Access Control
HOST FINANCIAL PAYMENT FUNCTIONALITY			
auth capture	/vPOSt/mi/authcaptur e/	allowed	merchant login/password
auth capture	/vPOSt/ci/authcapture /	allowed	no access control
auth only	/vPOSt/mi/authonly/	allowed	merchant login/password
auth only	/vPOSt/ci/authonly/	allowed	no access control
adjust	/vPOSt/mi/adjust/	allowed	merchant login/password
forced post	/vPOSt/mi/forcedpost/	allowed	merchant login/password
offline auth	/vPOSt/mi/offlineauth/	allowed	merchant login/password
offline auth	/vPOSt/ci/offlineauth/	allowed	no access control
pre auth	/vPOSt/mi/preauth/	allowed	merchant login/password
pre auth comp	/vPOSt/mi/preauthcom p/	allowed	merchant login/password
return	/vPOSt/mi/return	allowed	merchant login/password
return	/vPOSt/ci/return/	allowed	no access control
void	/vPOSt/mi/void/	allowed	merchant login/password
HOST ADMINISTRATIVE PAYMENT FUNCTIONALITY			
balance inquiry	/vPOSt/mi/bi/	not allowed	merchant login/password

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host logon	/vPOSt/mi/hostlogon/	allowed	merchant login/password
parameter download	/vPOSt/mi/parameters dnld/	not allowed	merchant login/password
reconcile	/vPOSt/mi/reconcile/	allowed	merchant login/password
test host	/vPOSt/mi/testhost/	not allowed	merchant login/password

LOCAL FUNCTIONS & TRANSACTIONS

accum review	/vPOSt/mi/accum/revi ew/	not allowed	merchant login/password
batch review	/vPOSt/mi/batch/revie w/	not allowed	merchant login/password
cdt review	/vPOSt/mi/cdt/review/	not allowed	merchant login/password
cdt update	/vPOSt/mi/cdt/update /	allowed	merchant login/password
cpt review	/vPOSt/mi/cpt/review	not allowed	merchant login/password
cpt update	/vPOSt/mi/cpt/update /	allowed	merchant login/password
clear accum	/vPOSt/accum/clear/	allowed	merchant login/password
clear batch	/vPOSt/mi/batch/clear /	allowed	merchant login/password
hdt review	/vPOSt/mi/hdt/review/	not allowed	merchant login/password
hdt update	/vPOSt/mi/hdt/update /	allowed	merchant login/password
lock vPOS	/vPOSt/mi/lock/	allowed	merchant login/password
query txn	/vPOSt/ci/querytxn/	not allowed	no access control
query txn	/vPOSt/mi/querytxn/	not allowed	merchant login/password
tct review	/vPOSt/mi/tct/review/	not allowed	merchant login/password

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tct update	/vPOSt/mi/tct/update/	allowed	merchant login/password
unlock vPOS	/vPOSt/mi/unlock/	allowed	merchant login/password

URL Descriptions

This section describes the GET and POST arguments that are associated with each transaction URL. It also describes the results from the GET and POST methods. For URLs that produce any kind of results, the following fields are present in the HTML document that is returned by the vPOS Terminal Cartridge:

txnDate	Date of the transaction (mm/dd/yy or dd/mm/yy)
txnTime	Time of the transaction (hh:mm:ss GMT or hh:mm:ss local time)
merchantId	Merchant ID of the merchant using the vPOS terminal
terminalId	vPOS Terminal Id
txnNum	Transaction number of the given transaction
txnType	Type of transaction

For URLs that deal with financial transactions, the following fields are present in the HTML document that is returned by the vPOS terminal cartridge:

txnAmount	Transaction amount that is being authorized, forced posted, voided, etc.
poNumber	Purchase order number
authIdentNum	Authorization ID number for the transaction
retRefNum	Retrieval reference number for the given transaction
piInfo	Payment instrument information. This varies for different payment instruments. For example, in the case of credit cards, the credit card number (piAcctNumber) and expiration date (piExpDate) are returned.

Accumulate Review

URL Functionality: This is a local information inquiry function that retrieves the local (merchant's) transaction totals (accumulators).

GET Arguments: None.

GET Results: Retrieves the transaction totals for the merchant. Currently, the total is returned as an HTML document. The transaction totals currently returned are:

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creditAmt	Total Credit Amount since the last settlement logged in the vPOS terminal
creditCnt	Total Credit Count since the last settlement logged in the vPOS terminal
debitAmt	Total Debit Amount since the last settlement logged in the vPOS terminal
debitCnt	Total Debit Count since the last settlement logged in the vPOS terminal

Note: Accum Review is a local function, as opposed to Balance Inquiry which is done over the Internet with the host.

5

Adjust

URL Functionality: Corrects the amount of a previously completed transaction.

GET Arguments: None

GET Results: Because the Adjust transaction modifies data on the merchant server, the POST method should be used. Using the GET method returns an HTML form that uses the POST method to perform the transaction.

10

POST Arguments:

pvsTxnNum	Previous transaction number
txnAdjustedAmount	The adjusted transaction amount. Note that the original transaction amount is easily retrievable from the previous transaction number.

POST Results: On success, pvsTxnNum and txnAdjustedAmount are presented in the HTML document, in addition to the transaction fields described above.

15

Auth Capture

URL Functionality: This transaction is a combination of Auth Only (Authorization without capture) and Forced Post transactions.

20

GET Arguments: None

GET Results: Because the Auth Capture transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form that uses the POST method to perform the transaction.

POST Arguments:

25

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piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields described above is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into a vPOS Terminal transaction log for both instances.

Auth Only

URL Functionality: Validates the cardholder's account number for a Sale that is performed at a later stage. The transaction does not confirm the sale to the host, and there is no host data capture. The vPOS captures this transaction record and later forwards it to confirm the sale in the Forced Post transaction request.

GET Arguments: None.

GET Results: Because the Auth Only transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form that uses the POST method to perform the transaction.

POST Arguments:

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into vPOS Terminal transaction log for both instances.

NOTE: The /vPOST/ci/authonly/ URL should be used for customer-initiated transactions. /vPOST/mi/authonly/ should be used for merchant-initiated transactions.

Balance Inquiry

URL Functionality: Performs an on-line inquiry of the merchant's balance.

GET Arguments: None

GET Results:

MrchtBlncA	Merchant balance amount for a given merchant. The
mt	balance amount at any given time is the difference between

the credit and debit amount since the last settlement between the merchant and the acquirer.

Batch Review

URL Functionality: Retrieves all records from the transaction log or the batch.

GET Arguments: None

- 5 **GET Results:** The GET method retrieves the transactions that have been batched in the vPOS terminal for future reconciliation. The batch can be cleared from the vPOS terminal after a manual reconciliation between the acquirer and the vPOS. The batch data is retrieved as a set of records and is formatted as a table in the HTML document. The following fields are present in a typical record:

10

NTransType	Transaction type
NPurchOrderNo	Purchase order number
SzAcctNum	Customer's payment instrument account number
SzExpDate	Customer's payment instrument expiration date
SzTransAmt	Transaction amount
SzTransDate	Transaction date
SzTransTime	Transaction time
SzRetrievalRefNum	Transaction's retrieval reference number
SzAuthId	Authorization ID for the transaction
SzOrigAmt	Original transaction amount
SzBatchNum	Batch number for the given transaction
NCurrencyType	Currency in which the transaction was done
LnTransNum	Transaction number

CDT Review

URL Functionality: Displays the vPOS terminal configuration data corresponding to the Card Definition Table (CDT).

- 15 **GET Arguments:** None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted using the /vPOST/mi/cdt/update/ URL to update the card definition table. Not all fields in the card definition table are editable. The following fields are returned in a form to the user:

20

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NHostIndex	Index into the Host Definition Table or the Acquirer that maps to this card issuer.
SzPANLo	Low end of the PAN (Primary Account Number) range
SzPANHi	High end of the PAN range
NMaxPANDigit	Maximum number of digits in the PAN for this acquirer.
NMinPANDigit	Minimum number of dits in the PAN for the acquirer
SzCardLabel	Card Issuer's name
Transactions	Specifies if a particular transaction is allowed for a given
Available bit	card range.
vector	

CDT Update

URL Functionality: Updates the vPOS terminal configuration data corresponding to the Card Definition Table (CDT).

GET Arguments: None

5 **GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the /vPOSt/mi/cdt/update URL to update the card definition table.

POST Arguments: (Editable CDT fields need to be decided.)

POST Results: (Depends on editable CDT fields, and therefore needs to be decided.)

10

Clear Accumulator

URL Functionality: Zeroes out the accumulator totals currently resident in the vPOS terminal.

GET Arguments: None.

15 **GET Results:** Presents a form that uses the POST method to zero the accumulators.

POST Arguments: None.

POST Results: Zeroes the accumulators/transaction totals in the vPOS terminal.

Clear Batch

20 **URL Functionality:** Zeroes out the transaction logs currently batched in the vPOS terminal.

GET Arguments: None.

GET Results: Presents a form that uses the POST method to clear the batch.

POST Arguments: None.

25 **POST Results:** Zeroes the transactions that comprise the batch in the vPOS terminal.

-35-

Forced Post

URL Functionality: Confirms to the host the completion of a sale, and requests for data capture of the transaction. This is used as a follow-up transaction after doing an Authorization (Online or Off-line) transaction.

5 **GET Arguments:** None.

GET Results: Returns the HTML form for performing the Forced Post transaction.

POST Arguments:

pvsTxnNum the previous transaction number from an auth only transaction

10 **POST Results:** On success, pvsTxnNum is presented in the HTML document. On failure, an HTML document is returned that contains the reason for the failure of the transaction.

HDT Review

15 **URL Functionality:** Displays the vPOS terminal configuration data corresponding to the Host Definition Table (HDT).

GET Arguments: None

20 **GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted using the /vPOSt/mi/hdt/update URL to update the hosts definition table. Not all fields in the host definition table are editable. The following fields are returned in a form to the user:

szTermId	Terminal ID for this vPOS terminal
szMerchId	Merchant ID for this vPOS terminal
szCurrBatchNum	Current batch number existing on the vPOS
szTransNum	Reference number for the next transaction in the vPOS transaction log/batch. This is generated by vPOS and is not editable by the merchant.
szTPDU	Transport Protocol Data Unit. Required for building the ISO 8583 packet.
InSTAN	System trace number; message number of the next transaction to be transmitted to this acquirer.
szNII	Network International Number. Required for building the ISO 8583 packet.
szHostName	Name for identifying the host.

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nHostType	Host type
nNumAdv	Number of off-line transactions that can be piggy-backed at the end of an on-line transaction.
Data Capture Required Bit	Specifies for which transactions data capture is required.
vector:	

HDT Update

URL Functionality: Updates the vPOS terminal configuration data corresponding to the Host Definition Table (HDT).

GET Arguments: None

- 5 **GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted to the merchant server using the /vPOST/mi/hdt/update URL to update the host definition table

Unlock vPOS

URL Functionality: Local function that starts the vPOS at the start of the day.

- 10 **GET Arguments:** None.

GET Results: Returns an HTML form that uses the POST method to perform this transaction.

POST Arguments: None.

- 15 **POST Results:** Resets a Boolean flag on the merchant server that enables transactions to be accepted by the vPOS terminal.

Offline Auth

- 20 **URL Functionality:** This transaction is same as the "Authorization Only" transaction, except that the transaction is locally captured by the vPOS terminal without having to communicate with the host. A Forced Post operation is done as a follow-up operation of this transaction.

GET Arguments: None.

GET Results: Because the Offline Auth transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form for using the POST method to perform the transaction.

- 25 **POST Arguments:**

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields described in Section 4.1 is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into vPOS terminal transaction log for both instances.

5

Parameter Download

URL Functionality: Downloads the vPOS configuration information from the host and sets up the vPOS in the event of the configuration data being changed.

GET Arguments: None

10 **GET Results:** Retrieves an HTML form that uses the POST method for the parameter download transaction.

POST Arguments: None.

POST Results: Downloads the following parameters from the host and uploads them into the vPOS terminal configuration table.

- card/issuer definition table (CDT)
- host/acquirer definition table (HDT)
- communications parameter table (CPT)
- terminal configuration table (TCT)

The various configuration parameters can be reviewed and modified using the URLs for the desired functionality.

20

Pre Auth

URL Functionality: Used in lodging and hotel establishments to pre-authorize a charge that is completed some time in future.

GET Arguments: None

GET Results: Retrieves the HTML form for posting the pre-authorization transaction.

25 **POST Arguments:**

piAcctNumber Payment Instrument account number, e.g., Visa credit card number

piExpDate Expiration date

Pre Auth Comp

URL Functionality: Completes a pre-authorization transaction.

GET Arguments: None

30 **GET Results:** Retrieves the HTML form for posting the pre-authorization completion transaction.

POST Arguments:

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pvsTxnNum Previous transaction number from an auth only
transaction

POST Results: On success, pvsTxnNum is presented in the HTML document. On failure, an HTML document is returned that contains the reason for the failure of the transaction.

5

Reconcile

URL Functionality: This transaction is done at the end of the day to confirm to the host to start the settlement process for the transactions captured by the host for that particular vPOS batch.

10 **GET Arguments:** None

GET Results: Retrieves the HTML form for posting the Reconcile transaction.

POST Arguments: None.

15 **POST Results:** On success, the reconcile function prints any discrepancies in the merchant's batch of transactions and totals vis-a-vis the host's batch of transactions in totals. The output format is a combination of the output of the Batch Review and Accum Review transactions.

Return

20 **URL Functionality:** Credits the return amount electronically to the consumer's account when previously purchased merchandise is returned. The vPOS terminal captures the transaction record for this transaction.

GET Arguments: None

GET Results: Retrieves the HTML form for posting the Return transaction.

POST Arguments:

25 PrevTxnNum Reference to the previous transaction number

The previous transaction has access to the following fields:

TxnAmount	Transaction amount
PiAccountNum	Payment instrument account number
PiExpDate	Payment instrument expiration date

POST Results: On success, pvsTxnNum is presented in the HTML document, in addition to

Test Host

5 **URL Functionality:** Checks the presence of the host and also the integrity of the link from the vPOS to the host.

GET Arguments: None.

GET Results: On success, an HTML document is returned that reports success in connecting to the host. On failure, an HTML document is returned that reports the error encountered in testing the host.

10 **Lock vPOS**

URL Functionality: This local function locks or stops the vPOS terminal from accepting any transactions.

GET Arguments: None.

GET Results: Returns an HTML form that posts the locking of the vPOS terminal.

15 **POST Arguments:** None.

POST Results: On success, an HTML document is returned that contains the status that vPOS terminal was successfully. On failure, an HTML document is returned that reports the cause of failure of the operation, e.g., access denied, the vPOS terminal is already locked or is presently processing a transaction, etc.

20 **Void**

URL Functionality: Cancels a previously completed draft capture transaction.

GET Arguments: None.

GET Results: Retrieves an HTML form for posting the Void transaction.

25 **POST Arguments:**

pvsTxnNum	Transaction number from a previous Auth Only transaction.
-----------	---

Host Logon

30 **URL Functionality:** Administrative transaction used to sign-on the vPOS with the host at the start of the day, and also to download encryption keys for debit transactions.

GET Arguments: None

GET Results: Retrieves an HTML form for posting the Host Logon transaction.

POST Arguments: None.

POST Results: Currently, debit card based transactions are not supported. The result is an HTML document indicating the success or failure of the host logon operation.

CPT Review

- 5 **URL Functionality:** Returns the vPOS terminal configuration data corresponding to the Communications Parameter Table (CPT).

GET Arguments: None

- GET Results:** The GET method returns a default HTML form that contains the current configuration values corresponding to the vPOS terminal's communication parameters. The form can be filled out and posted to the merchant server using the /vPOST/mi/cpt/update URL to update the communications parameter table. The following fields are returned in a form to the user:

SzAcqPriAddress	Primary Host address
SzAcqSecAddress	Secondary Host address
SzActTerAddress	Tertiary Host address
NRespTimeOut	Time-out value (in seconds) before which the vPOS should receive a response from the host

CPT Update

- 15 **URL Functionality:** Updates the vPOS terminal configuration data corresponding to the Communications Parameter Table (CPT).

GET Arguments: None

- GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted to update the communication parameter table.

POST Arguments:

SzAcqPriAddress	Primary Host address
SzAcqSecAddress	Secondary Host address
SzActTerAddress	Tertiary Host address
NRespTimeOut	Time-out value (in seconds) before which the vPOS should receive a response from the host

- 25 **POST Results:** On success, the HTML document returned by the vPOS contains the values set by the merchant. On failure, the HTML document contains the reason for the failure of the invocation of the URL.

TCT Review

URL Functionality: Returns the vPOS terminal configuration data corresponding to the Terminal Configuration Table (TCT).

GET Arguments: None.

- 5 **GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the /vPOST/mi/tct/update URL to update the terminal configuration table. The following fields are returned in a form to the user:

SzMerchName	Merchant name
SzSupervisorPwd	Supervisor password
FvPOSLock	1= vPOS locked, 0 = vPOS unlocked
SzAuthOnlyPwd	Password for initiating auth-only transaction
SzAuthCaptPwd	Password for initiating auth with capture transaction
SzAdjustPwd	Password for adjust transaction
SzRefundPwd	Password for refund transaction
szForcedPostPwd	Password for forced post transaction
szOfflineAuthPwd	Password for offline auth transaction
szVoidPwd	Password for void transaction
szPreAuthPwd	Password for pre-authorization transaction
szPreAuthCompP wd	Password for pre-authorization completion

TCT Update

- 10 **URL Functionality:** Updates the vPOS terminal configuration data corresponding to the Terminal Configuration Table (TCT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the

- 15 /vPOST/mi/tct/update URL to update the terminal configuration table.

POST Arguments: All arguments in TCT Review functionality are the returned values from the /vPOST/mi/tct/update the URL.

szMerchName	Merchant name
szSupervisorPwd	Supervisor password
fvPOSLock	1= vPOS locked, 0 = vPOS unlocked
szAuthOnlyPwd	Password for initiating auth-only transaction
szAuthCaptPwd	Password for initiating auth with capture transaction
szAdjustPwd	Password for adjust transaction

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szRefundPwd	Password for refund transaction
szForcedPostPwd	Password for forced post transaction
szOfflineAuthPwd	Password for offline auth transaction
szVoidPwd	Password for void transaction
szPreAuthPwd	Password for pre-authorization transaction
szPreAuthCompP	Password for pre-authorization completion
wd	

POST Results: On success, the POST modifies values of the terminal configuration table parameters. On failure, the HTML document contains the reason for the failure of the transaction.

5

Query Transactions

URL Functionality: Permits the merchant and customer to query a given transaction corresponding to a transaction number.

GET Arguments:

txnNum	Transaction number
--------	--------------------

10

GET Results: For a given transaction, the URL returns an HTML document. If a transaction refers to an older transaction, the transaction's entire history is made available.

URL results

15

Depending upon the method (GET/POST) as well as the success or failure of the HTTP request, different documents are returned to the user. The vPOS terminal provides a framework whereby different documents are returned based upon a number of preferences. Currently the language and content-type are supported as preferences. A simple framework is proposed here. Each of the transaction has a set of documents associated with it: form for the payment transaction, GET success, GET failure, POST success, and POST failure.

20

25

In the directory structure defined below, documents are stored corresponding to the preferences. The top level of the directory structure is the content-type, the next level is language (for NLS support). For example, to create text/html content in US English & French, the directory structure given below would contain the HTML documents for each of the transactions. The vPOS terminal cartridge has a configuration file that allows the user to specify the content-type as well as the language to be used for a cartridge. The first release of the vPOS terminal cartridge supports one content-type and language for each server.

Data Structures & Functions

Functions

A brief description of the Virtual Point of Sale Terminal cartridge functions are provided below. vPOSTInit(), vPOSTExec() and vPOSTShut() are the entry points
5 required for each cartridge in accordance with a preferred embodiment. The other functions implement some of the key vPOST cartridge functionality. In the block diagram shown in Figure 15B, the vPOS provides an interface for transactions which are initiated both by the consumer and the merchant. The merchant initiates a transaction from a Graphical User Interface (GUI) 1550 and all the transactions that
10 are initiated by the consumer are routed by the Merchant WEB Server 1545.

The Authorization/Data Capture Module 1560 processes the requests originated by the merchant or the consumer and routes them to the Protocol Module 1565. The Protocol Module is responsible for building the payment protocol request packet
15 (e.g., an SSL-encapsulated ISO 8583 packet) 1570 before sending the request to the Gateway 1579. Then, the Gateway 1579 awaits a response from the Protocol Module 1565, and upon receiving the response, the Gateway 1579 parses the data and provides unwrapped data to the Authorization/Data-Capture Module 1560. The Authorization/Data-Capture Module 1560 analyzes the response and updates the
20 Transaction Log 1580. The Transaction Log 1580 contains information concerning any successfully completed transactions and the accumulators or the transaction totals. The vPOS terminal creates and maintains the Transaction Log 1580, and the vPOS Configuration Data 1585 contains information which is used to configure the behavior of the vPOS. The entire vPOS functionality is thread-safe and hence using
25 the vPOS in a multi-threaded environment does not require any additional interfacing requirements. Figures 36-48 are vPOS screen displays in accordance with a preferred embodiment.

Payment Functionality

As discussed above, the different Payment Functionality provided by the vPOS
30 terminal can be divided into two main categories as "Merchant Initiated" and "Consumer Initiated." Some of these transactions require communication with the Gateway and these transactions are referred to as "Online Transactions." The transactions which can be done locally to the merchant without having to communicate are referred to as "Local Functions/Transactions." In order to provide
35 support for many different types of Payment Instruments, the vPOS Payment Functionality have been categorized. Host payment functionality and transactions require communication with the host either immediately or at a later stage. Each of

the host financial payment transactions come to this category and require a Payment Instrument. These transactions can be initiated with different types of Payment Instruments which the vPOS terminal supports.

- 5 An authorization without capture transaction is used to validate the card holder's account number for a sale that needs to be performed at a later stage. The transaction does not confirm a sale's completion to the host, and there is no host data capture in this event. The vPOS captures this transaction record and later forwards it to the host to confirm the sale in a forced post transaction request. An
- 10 authorization without capture transaction can be initiated both by the consumer and the merchant. A forced post transaction confirms to a host computer that a completion of a sale has been accomplished and requests data capture of the transaction. The forced post transaction is used as a follow-up transaction after doing an authorization (Online or Off-line) transaction. The transaction can be
- 15 initiated only by the merchant. The authorization with post transaction is a combination of authorization without capture and forced post transactions. This transaction can be initiated both by the consumer and the merchant.

- The offline post transaction is identical to the "authorization without capture" transaction, except that the transaction is locally captured by the vPOS without initiating communication with a host. A forced post operation is done as a follow-up operation of this transaction. This transaction can be initiated by both the consumer and the merchant. The return transaction is used to credit the return amount electronically to the consumer's account when a purchased merchandise is
- 20 returned. The vPOS captures the return transaction record when the merchandise is returned, and this transaction can be initiated only by the merchant. The void transaction cancels a previously completed draft capture transaction. The vPOS GUI provides an interface for retrieving a transaction record required to be voided from the batch and passes it to the Authorization/Data-Capture module after
- 25 confirmation. The batch record is updated to reflect the voided transaction after getting an approval from the gateway. This transaction can be initiated only by the merchant.
- 30

- The pre-authorization transaction is identical to the authorization without capture transaction, but the consumers' "open-to-buy" amount is reduced by the pre-authorization amount. An example of this type of transaction is the "check-in" transaction in a hotel environment. A check-in transaction sends a pre-
- 35

authorization request to the host, so that an amount required for the customers' stay in the hotel is reserved. The pre-authorization transaction is followed by a pre-authorization complete transaction. This transaction can be initiated both by the consumer and the merchant.

5

The pre-authorization complete transaction is done as a follow-up to the pre-authorization transaction. This transaction informs the host of the actual transaction amount. The pre-authorization complete transaction amount could be more or less than the pre-authorization amount. An example is the "check-out" transaction in a hotel environment. The check-out amount can be less than or more than the check-in amount. This transaction can only be initiated by a merchant.

10

The adjust transaction is initiated to make a correction to the amount of a previously completed transaction. The adjust transaction can be initiated only by the merchant. The host administrative transactions do not require any payment instrument. The balance inquiry transaction is used for on-line inquiry into the balance of the merchant's account. The batch data or the configuration data is not affected by this transaction. The reconciliation or close transaction is processed at the end of the day to start the settlement process for the transactions captured by the host for that particular vPOS. The host log-on transaction is an administrative transaction which is used to synchronize the vPOS with the host at the start of the day and also initiate a fresh batch at the vPOS terminal.

15

20

The parameters download transaction is used to download the vPOS configuration information from the host and set-up the vPOS in the event of any change in the configuration data. A test transaction is used to detect the presence of a host and the status of a link from the vPOS to the host. Local transactions or functions are initiated by a merchant and do not require communication with the gateway. These transactions can only be initiated by a merchant. The totals or accumulators review is a local information inquiry function and is used to retrieve the local (merchant's) totals. The detail transaction or the batch review function is used to retrieve all the records from the transaction log or the batch. The clear batch function is used to start a fresh batch. This transaction is utilized to electronically reconcile the vPOS with the host and to manually reconcile the vPOS with the host. After completing the manual reconciliation processing, the merchant can initiate this transaction to start a fresh batch. The clear accumulator function is similar to the clear batch functionality and resets all vPOS terminal accumulators to zero. This function is

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required when the merchant is not able to reconcile the vPOS with the host electronically. The vPOS unlock or start transaction is a local function used to start the vPOS at the start of the day. The vPOS lock or stop function is used to Lock or stop the vPOS from accepting any transactions. The vPOS configuration setup function is used to setup the vPOS configuration data. The vPOS configuration data is divided into different tables, for example, the Card/Issuer Definition Table (CDT), the Host/Acquirer Definition Table (HDT), the Communications Parameters Table (CPT) and the Terminal Configuration Table (TCT). The following sections explain each of these configuration tables in detail.

Host Definition Table (HDT)

The table contains information specific to the acquirer.

Field	Attributes/ Bytes	Field Description/Comments
Terminal Identifier	ANS(20)	Terminal ID for this acquirer/host
Merchant Identifier	ANS(20)	Merchant ID for this acquirer/host
Current Batch Number	N(6)	Batch Number for the batch currently existing on the vPOS
Transaction Number	I(2)	Reference Number for next transaction in the vPOS transaction log/batch (vPOS generated)
TPDU	AN(10)	Transport Protocol Data Unit - Required for building the ISO 8583 packet.
STAN	L(4)	Systems Trace Number - Message Number of the transaction to be transmitted next for this acquirer.
NII	N(3)	Network International Identifier - Required for building the ISO 8583 packet.
Host Name or Label	ANS(20)	Name for identifying the host, e.g., "AMEX-SIN". This is only a text string and is used for the purpose of identifying the host.
No. of advice messages	I(2)	No. of off-line transactions (advice messages) that can be piggy-backed at the end of an on-line transaction. If set to zero then piggy-backing is disabled.

The following fields specify whether Data Capture is required for a particular transaction for this acquirer.

Field	Attributes/ Bytes	Field Description/Comments
Host Protocol Type	I(2)	Host Protocol type, e.g., ISO 8583, SET, etc.,
Host Protocol Sub-Type	I(2)	Sub protocol type, e.g., AMEX-ISO8583, MOSET, etc.,
Auth Only DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Auth Capture DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Adjust DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Refund DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Cash Advance DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Cash Back DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Off-line Auth DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Void DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Pre-Auth DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Pre-Auth Complete DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED

Card Definition Table (CDT)

This table contains information which are specific to the card issuer.

Field	Attributes/ Bytes	Field Description/Comments
Host Index	I(2)	Index into the HDT or the acquirer which maps to this card issuer.
PAN Low Range	N(19)	Low end of the PAN range .
PAN High Range	N(19)	High end of the PAN range.
Minimum PAN digits	I(2)	The minimum number of digits in the PAN for this acquirer.
Maximum PAN digits	I(2)	The maximum number of digits in the PAN for this acquirer.
Card Label	ANS(20)	Card Issuer Name for identification, e.g., VISA.

The following fields specify whether a particular transaction is allowed for a card range.

Field	Attributes/ Bytes	Field Description/Comments
Auth Only Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Auth Capture Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Adjust Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Refund Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Cash Advance Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Cash Back Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Off-line Auth Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Void Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Pre-Auth Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Pre-Auth Complete Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED

Communications Parameter Table (CPT)

- 5 This table contains communications parameters information specific to an acquirer. The HDT and this table have a one-to-one mapping between them.

Field	Attributes/ Bytes	Field Description/Comments
Primary Address	AN(100)	Primary Host Address (Telephone number, IP address, etc.)
Secondary Address	AN(100)	Secondary Host Address to be used if the Primary Address is busy or not available.
Tertiary Address	AN(100)	Tertiary Host Address.
Response Time-out	I(2)	Time-out value (in seconds) before which the vPOS should receive a response from the host.

Terminal Configuration Table (TCT)

- 10 This table contains information specific to a particular vPOS terminal.

Field	Attributes/ Bytes	Field Description/Comments
-------	----------------------	----------------------------

	Bytes	
Merchant Name	ANS(100)	Name of the merchant having the vPOS terminal.
vPOS Lock Flag	Bit (1 bit)	1 = vPOS Locked, 0 = vPOS Unlocked

Payment Instruments

As discussed above, the vPOS terminal supports different Payment Instruments and each of the Payment Functions described above can be initiated by these different Payment Instruments. The consumer making a purchase from a merchant provides a choice of payment methods depending upon their personal preference. The Payment Instrument Class Hierarchy which is used by the different vPOS terminal Payment Functions is described below.

Message Sequence Diagram

Figure 17 shows a typical message flow between the consumer, merchant, vPOS terminal and the Gateway. This section describes the different classes listed in the previous section, their data and members, and defines the type of the transaction that is to be performed. Processing commences at 1700 when a merchant server receives a sales order and passes it via the vPOS Graphical User Interface (GUI) 1710 to an authorizer 1720 for approval and subsequent protocol processing 1730 and ultimately transmission via the gateway 1740 to the network.

20 **Class Name :**

CVPCLTransaction

Data :

Transaction Type (int)

Transaction Date and Time (CPCLDateTime)

25 Card Definition Table (CVPCL_CDT)

Host Definition Table (CVPCL_HDT)

Communications Parameters Table (CVPCL_CPT)

Terminal Configuration Parameters (CVPCL_TCT)

Batch Record (CVPCLBatch)

30 Accumulator Record (CVPCLAccum)

Member Functions :

CVPCLTransaction();

EStatus GetTransType();

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```
EStatus GetTransDateTime(CPCLDateTime&);
EStatus SetTransType(const int);
virtual EStatus InitializeTrans(TvPOSParamsBlk *) = 0;
virtual EStatus ExecuteTrans(TvPOSResultsBlk *) = 0;
5 virtual EStatus ShutDown() = 0;
```

Host Transaction Class Definitions

This section contains all the host transaction class definitions.

10 Host Transaction Class (CVPCLHostTrans)

This is an abstract base class derived from the CVPCLTransaction class and is used for deriving transaction classes which need to communicate with the host either immediately or at a later stage.

15 Class Name :

CVPCLHostTrans

Data :

Member Functions :

20 CVPCLHostTrans();

Financial Transaction Class (CVPCLFinancialTrans)

This is an abstract base class derived from the CVPCLHostTrans. This class is used to derive transaction classes which require a payment instrument (e.g., a Credit
25 Card) associated with them to perform the transaction.

Class Name :

CVPCLFinancialTrans

Data :

```
30 Transaction Amount (CVPCLAmt)
Purchase Order Number (char[][])
Transaction Number (char[])
Authorization Identification Number (char[])
Retrieval Reference Number (char[])
35 Batch (CVPCLBatch)
Accumulators (CVPCLAccumulators)
```

Member Functions :

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```

    CVPCLFinancialTrans();
    EStatus GetTransAmt(CVPCLAmt&);
    EStatus GetPurchOrderNum(char *);
    EStatus GetTransRefNum(char *);
5    EStatus GetRetRefNum(char *);
    EStatus GetAuthId(char *);
    EStatus GetCurrencyType(EPCLCurrency *);
    EStatus SetPurchOrderNum(const char *);
    EStatus SetTransRefNum(const char *);
10   EStatus SetRetRefNum(const char *);
    EStatus SetAuthId(const char *);
    EStatus SetCurrencyType (const char *)

```

15 **Financial Credit Card Transaction Class (CVPCLFinCCTrans)**

This is the base abstract class for the financial host transaction which require a Credit Card payment instrument. This class is derived from the CVPCLFinancialTrans.

20 **Class Name :**

CVPCLFinCCTrans

Data :

Credit Card Payment Instrument (CPCLCreditCard)

25 **Member Functions :**

CVPCLFinCCTrans();

Credit Card Authorization Only Transaction Class (CVPCL_CCAuthOnly)

30 This is the class derived from the CVPCLFinCCTrans class and implements the Authorization Only Transaction.

Class Name :

CVPCL_CCAuthOnly

35 **Data :**

Member Functions :

-52-

```
    CVPCL_CCAuthOnly();  
    EStatus InitializeTrans(TvPOSPParamsBlk *);  
    EStatus ExecuteTrans(TvPOSResultsBlk *);  
    EStatus ShutDownTrans();  
5    EStatus FormBatchRec();
```

Credit Card Authorization with Capture Transaction Class (CVPCL_CCAuthCapt)

This is the class derived from the CVPCLFinCCTrans class and implements the Authorization with Data Capture Transaction.

10

Class Name :**CVPCL_CCAuthCapt****Data :****Member Functions :**

```
15    CVPCL_CCAuthCapt();  
    EStatus InitializeTrans(TvPOSPParamsBlk *);  
    EStatus ExecuteTrans(TvPOSResultsBlk *);  
    EStatus ShutDownTrans();  
    EStatus FormBatchRec();  
20
```

Credit Card Return Transaction Class (CVPCL_CCReturn)

This is the class derived from the CVPCLFinCCTrans class and implements the Return Transaction.

25 **Class Name :****CVPCL_CCReturn****Data :****Member Functions :**

```
30    CVPCL_CCReturn();  
    EStatus InitializeTrans(TvPOSPParamsBlk *);  
    EStatus ExecuteTrans(TvPOSResultsBlk *);  
    EStatus ShutDownTrans();  
    EStatus FormBatchRec();  
35
```

Credit Card Pre-Authorization Transaction Class (CVPCL_CCPreAuth)

-53-

This is the class derived from the CVPCLFinCCTrans class and implements the Pre-Authorization Transaction.

Class Name :5 **CVPCL_CCPreAuth****Data :****Member Functions :**

 CVPCL_CCPreAuth();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
10 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();
 EStatus FormBatchRec();

Credit Card Off-line Authorization Only Transaction Class15 **(CVPCL_CCOfflineAuth)**

This is the class derived from the CVPCLFinCCTrans class and implements the Offline Authorization Class Transaction.

Class Name :20 **CVPCL_CCOfflineAuth****Data :****Member Functions :**

 CVPCL_CCOfflineAuth();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
25 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();
 EStatus FormBatchRec();

Credit Card Adjust Transaction Class (CVPCL_CCAdjust)

30 This is the class derived from the CVPCLFinCCTrans class and implements the Adjust Transaction.

Class Name :**CVPCL_CCAdjust**35 **Data :****Member Functions :**

-54-

```
    CVPCL_CCAdjust();  
    EStatus InitializeTrans(TvPOSPParamsBlk *);  
    EStatus ExecuteTrans(TvPOSResultsBlk *);  
    EStatus ShutDownTrans();  
5    EStatus FormBatchRec();
```

Credit Card Void Transaction Class (CVPCL_CCVoid)

10 This is the class derived from the CVPCLFinCCTrans class and implements the Void Transaction.

Class Name :

CVPCL_CCVoid

Data :

15

Member Functions :

```
    CVPCL_CCVoid();  
    EStatus InitializeTrans(TvPOSPParamsBlk *);  
    EStatus ExecuteTrans(TvPOSResultsBlk *);  
20    EStatus ShutDownTrans();  
    EStatus FormBatchRec();
```

Credit Card Forced Post Transaction Class (CVPCL_CCForcedPost)

25 This is the class derived from the CVPCLFinCCTrans class and implements the Forced Post Transaction.

Class Name :

CVPCL_CCForcedPost

Data :

30

Member Functions :

```
    CVPCL_CCForcedPost();  
    EStatus InitializeTrans(TvPOSPParamsBlk *);  
    EStatus ExecuteTrans(TvPOSResultsBlk *);  
35    EStatus ShutDownTrans();  
    EStatus FormBatchRec();
```

Pre-Authorization Complete Transaction Class (CVPCL_CCPreAuthComp)

This is the class derived from the CVPCLFinCCTrans class and implements the Pre-Authorization Completion Transaction.

5 **Class Name :**

CVPCL_CCPreAuthComp

Data :

Member Functions :

10 CVPCL_CCPreAuthComp();
 EStatus InitializeTrans(TvPOSParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();
 EStatus FormBatchRec();

15

Credit Card Balance Inquiry Class (CVPCL_CCBalanceInq)

This class is derived from the CVPCLFinCCTrans class and is used to perform the Merchant Balance Inquiry function.

20 **Class Name :**

CVPCL_CCBalanceInq

Data :

Member Functions :

25 CVPCL_CCBalanceInq();
 EStatus InitializeTrans(TvPOSParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

30 **Administrative Host Transaction Class (CVPCLAdminHostTrans)**

This is an abstract base class derived from the CVPCLHostTrans class and is used to derive the administrative host transaction classes.

Class Name :

35 **CVPCLAdminHostTrans**

Data :

Member Functions :

CVPCLAdminHostTrans();
int GetHostIndex();
EStatus SetHostIndex (const int);

5

Reconcile Transaction Class (CVPCLReconcile)

This is the class derived from the CVPCLAdminHostTrans class and implements the Reconcile or Close functionality.

Class Name :10 **CVPCLReconcile****Data :****Member Functions :**

CVPCLReconcile();
15 EStatus InitializeTrans(TvPOSParamsBlk *);
EStatus ExecuteTrans(TvPOSResultsBlk *);
EStatus ShutDownTrans();

Host Log-on Transaction Class (CVPCLHostLogon)

20 This is the class derived from the CVPCLAdminHostTrans class and implements the Host Log-on Transaction.

Class Name :**CVPCLHostLogon**25 **Data :****Member Functions :**

CVPCLHostLogon();
EStatus InitializeTrans(TvPOSParamsBlk *);
30 EStatus ExecuteTrans(TvPOSResultsBlk *);
EStatus ShutDownTrans();

Parameters Download Transaction Class (CVPCLParamsDwnld)

35 This is the class derived from the CVPCLAdminHostTrans class and implements the Parameters Download (vPOS configuration information from the host) functionality.

Class Name :

-57-

CVPCLParamsDwnld**Data :****Member Functions :**

5 CVPCLParamsDwnld();
 EStatus InitializeTrans(TvPOSParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

10 **Test Transaction Class (CVPCLTestHost)**

This is the class derived from the CVPCLAdminHostTrans class and implements the Test functionality which is used to test the host and the link.

Class Name :

15 **CVPCLTestHost**

Data :**Member Functions :**

 CVPCLTestHost();
20 EStatus InitializeTrans(TvPOSParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

Local Transaction Class Definitions (CVPCLocalTrans)

25 This is the abstract base class for all the transactions that are performed locally to the vPOS.

Class Name :**CVPCLocalTrans**

30 **Data :**

 Record Number (int)
 Host Index (int)

Member Functions :

 CVPCLocalTrans();
35 int GetRecNum();
 int GetHostIndex();
 EStatus SetRecNum(const int);

EStatus SetHostIndex(const int);

Virtual POS Lock/Stop Class (CVPCLvPOSLock)

This class implements the vPOS Lock or the Stop Local functionality. Under the
5 locked state the vPOS does not accept any transaction requests. The class is derived
from the CVPCLLocalTrans base class.

Class Name :

CVPCLvPOSLock

Data :

10 **Member Functions :**

CVPCLvPOSLock();

EStatus InitializeTrans(TvPOSParamsBlk *);

EStatus ExecuteTrans(TvPOSResultsBlk *);

EStatus ShutDownTrans();

15

Virtual POS UnLock/Start Class (CVPCLvPOSUnlock)

This class implements the vPOS UnLock or the Start Local functionality. The class is
derived from the CVPCLLocalTrans base class.

20 **Class Name :**

CVPCLvPOSUnlock

Data :

Member Functions :

25 CVPCLvPOSUnlock();

EStatus InitializeTrans(TvPOSParamsBlk *);

EStatus ExecuteTrans(TvPOSResultsBlk *);

EStatus ShutDownTrans();

30

Transaction Data Administration Class (CVPCLTransDataAdmin)

This is an abstract base class used to derive the classes which are required to
review/manage the transaction data which includes the batch data and the
accumulator data. The class is derived from the CVPCLLocalTrans base class.

35 **Class Name :**

CVPCLTransDataAdmin

Data :

Member Functions :

CVPCLTransDataAdmin();

Batch Review Class (CVPCLBatchReview)

5 This class is derived from the CVPCLTransDataAdmin base class and implements the batch review functionality

Class Name :

CVPCLBatchReview

Data :

10

Member Functions :

CVPCLBatchReview();

EStatus InitializeTrans(TvPOSPParamsBlk *);

EStatus ExecuteTrans(TvPOSResultsBlk *);

15 EStatus ShutDownTrans();

Clear Batch Class (CVPCLClearBatch)

This class is derived from the CVPCLTransDataAdmin base class and implements the clear batch functionality, which is used to clear the batch in the event of doing a manual reconciliation between the vPOS and the acquirer.

20

Class Name :

CVPCLClearBatch

Data :

25 **Member Functions :**

CVPCLClearBatch();

EStatus InitializeTrans(TvPOSPParamsBlk *);

EStatus ExecuteTrans(TvPOSResultsBlk *);

30 EStatus ShutDownTrans();

Accumulators Review Class (CVPCLAccumReview)

This class is derived from the CVPCLTransDataAdmin base class and implements the Accumulators Review functionality.

Class Name :

35 **CVPCLAccumReview**

Data :**Member Functions :**

-60-

```
CVPCLAccumReview();  
EStatus InitializeTrans(TvPOSPParamsBlk *);  
EStatus ExecuteTrans(TvPOSResultsBlk *);  
EStatus ShutDownTrans();
```

5

Clear Accumulators Class (CVPCLClearAccum)

This class is derived from the CVPCLTransDataAdmin base class and implements the Accumulators Clear functionality.

10 **Class Name :****CVPCLClearAccum****Data :****Member Functions :**

```
CVPCLClearAccum();  
EStatus InitializeTrans(TvPOSPParamsBlk *);  
EStatus ExecuteTrans(TvPOSResultsBlk *);  
EStatus ShutDownTrans();
```

15

vPOS Configuration Data Administration Class (CVPCLConfigDataAdmin)

20 This is an abstract base class and is used to derive classes which implement the functionality for managing the vPOS configuration data. The class is derived from the CVPCLLocalTrans base class.

Class Name :25 **CVPCLConfigDataAdmin****Data :****Member Functions :**

Acquirer Data or the Host Definition Table Review Class (CVPCL_HDTRReview)

30 This class is derived from the CVPCLConfigDataAdmin class and implements the Host Definition Table Review functionality.

Class Name :**CVPCL_HDTRReview****Data :**35 **Member Functions :**

```
CVPCL_HDTRReview();  
EStatus InitializeTrans(TvPOSPParamsBlk *);
```

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```
EStatus ExecuteTrans(TvPOSResultsBlk *);  
EStatus ShutDownTrans();
```

Issuer Data or the Card Definition Table Review Class (CVPCL_CDTRReview)

- 5 This class is derived from the CVPCLConfigDataAdmin class and implements the Card Definition Table Review functionality.

Class Name :

CVPCL_CDTRReview

Data :

- 10 **Member Functions :**

```
CVPCL_CDTRReview();
```

```
EStatus InitializeTrans(TvPOSParamsBlk *);
```

```
EStatus ExecuteTrans(TvPOSResultsBlk *);
```

- 15

```
EStatus ShutDownTrans();
```

Communication Parameters Table Review Class (CVPCL_CPTRReview)

This class is derived from the CVPCLConfigDataAdmin class and implements the Communications Parameters Table Review functionality.

20

Class Name :

CVPCL_CPTRReview

Data :

- 25 **Member Functions :**

```
CVPCL_CPTRReview();
```

```
EStatus InitializeTrans(TvPOSParamsBlk *);
```

```
EStatus ExecuteTrans(TvPOSResultsBlk *);
```

```
EStatus ShutDownTrans();
```

30

Terminal Configuration Table Review Class (CVPCL_TCTReview)

This class is derived from the CVPCLConfigDataAdmin class and implements the Terminal Configuration Table Review functionality.

- 35 **Class Name :**

CVPCL_TCTReview

Data :

Member Functions :

CVPCL_TCTReview();

5 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

Acquirer Data or the Host Definition Table Update Class (CVPCL_HDTUpdate)

10 This class is derived from the CVPCLConfigDataAdmin class and implements the Host Definition Table Update functionality.

Class Name :

CVPCL_HDTUpdate

Data :**15 Member Functions :**

CVPCL_HDTUpdate();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

20

Issuer Data or the Card Definition Table Update Class (CVPCL_CDTUpdate)

This class is derived from the CVPCLConfigDataAdmin class and implements the Card Definition Table Update functionality.

Class Name :

25 **CVPCL_CDTUpdate**

Data :**Member Functions :**

CVPCL_CDTUpdate();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

30

vPOS API Definition

35 This section explains in the vPOS API which are required for interfacing with the vPOS Class Library. All the different vPOS transactions can be initiated using the API defined in this section.

vPOSInitialize - Initialize vPOS

This API is used to start and initialize the vPOS. The API definition is disclosed below.

API Definition :

vPOSBool vPOSInitialize(void);

Parameters :

None

Returns :

TRUE or FALSE indicating whether the function call was a success.

10 vPOSExecute - Execute a vPOS Transaction

This API is used to execute a particular vPOS transaction.

API Definition :

vPOSBool vPOSExecute(TvPOSParamsBlk *, TvPOSResultsBlk *)

Parameters :

15 Pointer to the Parameters Structure (TvPOSParamsBlk)

Pointer to the Results Structure (TvPOSResultsBlk)

Returns :

TRUE or FALSE indicating whether the function call was a success.

20 vPOSShutDown - Shutdown the vPOS

This is used to shutdown the vPOS.

API Definition :

vPOSBool vPOSShutDown(void)

Parameters :

25 None

Returns :

TRUE or FALSE indicating whether the function call was a success.

vPOS Status Codes

30 This section details the different status codes (listed under the enumeration EStatus) which the vPOS returns for the different operations performed.

enum EStatus

{

35 eSuccess = 0, // Function call or operation successful
 eFailure, // General failure
 evPOSLocked, // vPOS locked, transaction not allowed
 // Transaction related error codes

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	ePmtInstNotSupported,	// Payment Instrument not supported
	eTransNotSupported,	// Transaction type not supported
	eTransInitErr,	// Transaction Initialization Failed
	eAdjustNotAllwd,	// Adjust not allowed on this transaction
5	eVoidNotAllwd,	// Void not allowed on this transaction
	eForcedPostNotAllwd,	// Forced Post not allowed on this transaction
	ePreAuthCompNotAllwd,	// Pre-Auth. not allowed on this transaction
	eAmtErr,	// Error in the amount passed
	eHDTLoadErr,	// Error during loading the HDT table
10	eCDTLoadErr,	// Error during loading the CDT table
	eCPTLoadErr,	// Error during loading the CPT table
	eTCTLoadErr,	// Error during loading the TCT table
	eHDTWriteErr,	// Error during writing to the HDT table
	eCDTWriteErr,	// Error during writing to the CDT table
15	eCPTWriteErr,	// Error during writing to the CPT table
	eTCTWriteErr,	// Error during writing to the TCT table
	eTCTFieldErr,	// Error handling a TCT table field
	eLuhnErr,	// Luhn check failed on the account
	eRangingErr,	// Card range not found
20	ePANLenErr,	// PAN length error
	eExpiredCard,	// Card expired
	eInvalidMonth,	// Invalid month in the expiration date
	eFileOpenErr,	// General file open error
	eFileCloseErr,	// General file close error
25		

vPOS Terminal Architecture

Figure 25 is a block diagram of the vPOS Terminal Architecture in accordance with a preferred embodiment. The Internet 2500 provides the communication processing necessary to enable the vPOS Terminal architecture. The terminal interface CGI 2520 communicates via the Internet to provide information to the vPOS OLE Server 2550 which formats information in accordance with the vPOS API DLL 2560 which uses the protocol class DLL 2570 to flesh out the message for delivery to the Gateway Server 2580. The collection of the vPOS OLE Server 2550, vPOS API DLL 2560 and the Protocol Class DLL 2570 make up the vPOS Software Development ToolKit (SDK) which are used to enable vPOS applications for interfacing with an Operator 2540.

vPOS/GATEWAY Architecture

The architecture of the Virtual Point of Sale (vPOS) and Virtual Gateway (GATEWAY) architecture maintains SET compliance while providing support for additional message types that are not enabled in SET. The architecture includes isolation of cryptographic details in a single module to facilitate single version government approval while maximizing the flexibility of the system for customization and facilitating transfer of updated versions on an acquirer specific basis. Figure 18 is a block diagram of the extended SET architecture in accordance with a preferred embodiment. Processing commences at function block 1800 for a consumer-originated transaction via the World Wide Web (WWW) or 1810 for a merchant-originated transaction on the Internet. In either case control passes immediately to the WWW server 1820 for the transaction to be appropriately formatted and the appropriate interface page presented, whether the transaction is a store front 1822, shopping cart 1824, pay page 1826, standard terminal administration 1828-1830 transaction, or an extended terminal transaction 1834. If processing requires authentication of the transaction, then control passes through the Virtual Point of Sale (vPOS) Application Programming Interface (API) library 1840 for SET compliant transactions and through the vPOS API extensions library for extensions to the SET protocol. Then, at function block 1842, if the transaction is SET compliant, and function block 1864 if the transaction is not SET compliant, a library of protocol stack information is used to conform the message before it is transmitted to a Gateway site for ultimate delivery to a bank host 1874 for authorization.

Extended SET messages are processed at the Gateway site on a two track basis with the division criteria being SET compliance (which will change over time as more functionality is put into SET) or SET extensions. Set compliant messages are processed via the protocol stack library 1862, while SET extensions are processed via the protocol stack extension library 1864. Then, at function block 1870 the gateway engine processes SET and Host specific code including gateway administration extensions 1872 that bypass the normal processing and flow directly from the merchant and consumer server 1820 to the gateway administration extensions 1872 to the Gateway Engine 1870.

As described above, there are three channels by which messages are exchanged between vPOS 1846 and GATEWAY 1856.

1. Standard SET messages

The standard SET messages are originated by the merchant software either via a pay page **1826** directly controlled by the consumer, or via an operator interface consisting of a set of HTML pages and associated executables launched by the pages (e.g. pay page **1826** and standard terminal administration **1828-1830**.) Each SET message type (e.g., authorization v. capture) transmits a different set of data and each requires a different Protocol Data Unit (PDU) to describe its encoding. Examples of how Standard SET messages are encoded are given in the SET documentation previously incorporated by reference.

10 2. Extended SET messages

The Extended SET messages are utilized as an "escape mechanism" to implement acquirer-specific messages such as settlement/reconciliation, employee logon/logoff, and parameter download. The messages are developed as a set of name-value pairs encapsulated in a PKCS-7 wrapper and wrapped in Multipurpose Internet Mail Extensions (MIME), described in a book by N. Borenstein & N. Freed, "RFC 1521: MIME (Multipurpose Internet Mail Extensions) Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies" (Sep. 1993). The name-value pairs can have arbitrary (8-bit) data, so arbitrary items can be passed through the extended SET channel, including executable programs and Dynamic Load Libraries (DLL)s. Figure **18B** illustrates a multipart MIME message with one Extended SET message and one Standard SET authorizing message. Mime is utilized as an outer wrapper **1890** to allow an Extended SET message **1891** to be transmitted as a compon of messages embedded in one MIME multipart message. In this manner, a standard SET message can be sent with an Extended SET message in one vPOS/GATEWAY communication transaction. Embedding the Extended SET messages in a PKCS-7 wrapper enables the same message authentication to occur as in standard SET messages. Thus, for SET-compliant and non-SET-compliant messages, the same mechanism may be used to restrict which entities the vPOS or Gateway will trust in any communications. An important concept in Extended SET is that all messages, of any type, are sent in a uniform name/value pair format, thus allowing a single Protocol Data Unit to suffice for any type of message sent through the Extended SET channel. Since arbitrary data may be sent this way, a mechanism must be provided to preclude the use of the Extended SET channel by parties other than approved financial institutions. If this is not ensured, then the NSA and the US Department of Commerce will not approve the software for export. SET itself to some degree ensures that this Extended SET channel is used only by financial institutions. The protocol stack extension library only processes messages that have

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been signed by a financial institution SET certificate that is in turn signed by a payment instrument brand certificate (such as Visa or MasterCard). Stronger control over the Extended SET channel can be achieved by further restricting processing of messages to those signed (either instead of or in addition to the

5 financial institution SET certificate) by a second certificate belonging to a third-party agency, either governmental or private (e.g., VeriFone, as manufacturer of the software).

10 In this way, a particular set of Extended SET messages can be implemented by Bank X, and a different set of messages by Bank Y. If a vPOS has an extended terminal transaction interface as shown in Figure 18A at block 1834 for Bank X, and has been configured to only accept messages from a Gateway with Bank X's certificate, then it will be able to communicate those messages to a Gateway that has the certificate for Bank X, and accepts messages of the types in Bank X's message set.

15 The vPOS will not be able to connect to the Bank Y gateway, or to any other system that purports to communicate via Extended SET. This restriction is further secured by utilizing a public key certificate that is "hard wired" into vPOS, and which is distributed only to gateways that use the Extended SET mechanism.

20 Figure 18C is an example flowchart of message processing in accordance with a preferred embodiment. Processing commences at function block 1880 when a message is received by an HTTPS server or other listener and passed to decision block 1883 to determine if the sending vPOS has transmitted an authentic message and if the vPOS is authorized to communicate with this gateway. If the message is

25 not authentic, then the message is logged as an error and the error is handled as shown in function block 1889. If the message is authentic, then the message is decrypted at function block 1884 and the PDU parses the message into name / value pairs. Then, based on the message type and the extended SET version information, the remaining message is parsed at function block 1885 and the

30 message is checked for conformance to the appropriate specification as shown at decision block 1887. If the message does not conform, then it is logged and the error handled at function block 1889. If the message conforms to the proper specification in decision block 1887 then the message is translated into the appropriate host format and sent to the host as shown in function block 1888.

35 Thus, when a gateway receives an incoming message from a vPOS and parses the Extended SET portion of the message, a single MIME message can transmit a SET message and/or an Extended Set Message.

An export license for the encryption can be obtained on a case-by-case basis, and since there will be potentially millions of vPOS's, it is desirable to obtain a commodities jurisdiction for the vPOS, to enable a single version of the vPOS (rather than one version for each bank) to be supported by the vPOS architecture. The architecture described here ensures that the single version of vPOS, no matter how it is configured with extended terminal transaction interfaces, cannot be used to communicate any data other than that contained in the extended SET messages that have been approved for export by the US government to be used exclusively for a specific bank.

Figure 18D is an example of a simple message between vPOS and Gateway using the Extended SET channel enabling an employee to sign on, or "logon" to a given terminal in accordance with the subject invention. The message must contain the employee's logon ID, a password to be verified by the bank host computer, and the date and time as shown at 1894. While the contents of the message are shown without encryption in Figure 18D, it should be noted that the information (including the logon password) are SET encrypted inside the PKCS-7 wrapper 1894. Certain fields may be designated as mandatory for an Extended SET message, to allow the Gateway or vPOS to decide how to handle the message. For the sake of clarity, in this message 1894, only two fields, "messagetype" and "ESETversion", are mandatory. These fields inform the Gateway that this message is of type "logon," and that the vPOS is using version "1.0A" of the ESET message formats defined for the Gateway. In this embodiment, the length indicator "[5]" is used to distinguish the length (in bytes) of the field of type "messagetype" in the message. In this way, there are no special end-of-data characters, and therefore arbitrary data need not have any "escaped" characters. It should be noted that using escaped characters will work equally well. Total message integrity is assured by the digital signatures in the PKCS-7 wrapper. This does not, however, preclude the use of other checksumming schemes for additional pinpointing of transmission or encoding errors. The messagetype and ESETversion name/value pairs facilitate Gateway look up of what name/value pairs are expected in the "logon" message. Some name/value pairs may be mandatory, and others may be optional.

Figure 18E is an example of a simple message between vPOS and Gateway using the Extended SET channel enabling an employee to sign on, or "logon" to a given terminal in accordance with the subject invention. In response to the logon request

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message from a vPOS, the Gateway may respond with a "logon accepted" message **1894**, as depicted in Figure **18E**, which vPOS, upon receipt and authentication, then uses to unlock the terminal for that user.

5 Figure **49** shows how the vPOS authenticates an incoming response to a request in accordance with a preferred embodiment. Processing commences at function block **4930** when a message is received by the HTTPS, SET server, or other listener that originated the request to which this response corresponds. The message is passed to decision block **4940** to determine if the sending Gateway has transmitted an
10 authentic message and if the gateway is authorized to communicate with this vPOS. If the message is not authentic, then the message is logged as an error or possible attack and the error is handled as shown in function block **4970**. If the message is authentic, then the message is decrypted at function block **4950** and the PDU parses the message into name/value pairs. Then, based on the message type and
15 the extended SET version information, the remaining message is parsed at function block **4960** and the message is checked for conformance to the appropriate specification as shown at decision block **4980**. If the message does not conform, then it is logged and the error handled at function block **4970**. If the message conforms to the proper specification in decision block **4980** then the message is translated into a standardized argument string to be passed to the appropriate
20 executable or code entry point in the vPOS, as shown in function block **4990**. Thus, when a vPOS receives an incoming message from a Gateway and parses the Extended SET portion of the message, the message may cause vPOS to execute a program that takes action or queries the user to take action.

25

3. Gateway-initiated messages

Since all SET messages between a merchant and an acquirer are currently merchant-initiated (as specified in the SET documentation), there must be a separate mechanism for initiating a message from a gateway, for example to request
30 the upload of management information base (MIB) data, or to download new parameters. This is accomplished by requiring the gateway to send a message to the merchant via a MIME-encapsulated PKCS-7 conformant message containing name-value pairs to the merchant server directly, rather than to the SET module. This channel is shown in Figure **18A** at block **1860**.

35

The message is verified for origination from the acquirer, and is utilized to either initialize a merchant action, such as to update the merchant's administration page

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(for example by blinking a message saying, "PLEASE RE-INITIALIZE YOUR TERMINAL"), or by initiating a request/response message pair originating from the merchant (for example, "HERE ARE THE CONTENTS OF MY MIB"). This is achieved by calling one of the extended terminal transaction interfaces (Figure 18A at 1834), which in turn initiates a SET or Extended SET transaction.

Gateway Customization via the Extended SET Channel

Gateway customization in extended SET is extremely powerful and a novel concept for vPOS processing. Each vPOS contains one or more "serial numbers" unique to each copy of the software (a serial number may be embedded in the software, or may be a component of a public key certificate used in the software). Once a merchant has selected an acquirer and obtained the appropriate certificates, the vPOS can be customized utilizing the communication link and messages containing customization applications. A bank distributes vPOS via different sales channels. The first is direct from a bank to an existing merchant with whom the bank already has an existing relationship. In this case, a version of vPOS already customized for a bank is sent to the merchant, either directly by a bank, or through a third-party distributor or service bureau. The customizations may involve modification or replacement of, for example, a store front 1822, shopping cart 1824, pay page 1826, standard terminal administration transaction interface 1828-1830 or an extended terminal transaction interface 1834. This is a standard model of distribution of software that is customized for small target market segments. The more interesting case, and the one that concerns the novel use of the Extended SET channel, is where the potential merchant acquires, through some non-bank channel, a "generic" vPOS which has not yet been customized to interact with a specific bank. This vPOS can communicate with a "test gateway", which the merchant may use to experiment with the various features of vPOS and to test the integration of the vPOS into a total online storefront. In order to actually transact business over the Internet, the merchant must first obtain a merchant ID from the merchant bank with which he signs an acquiring agreement. For online payment processing, the merchant must also obtain an appropriate set of digital credentials in the form of public key certificates and possibly additional passwords, depending on the financial institution. Once these credentials are obtained, the merchant is ready to customize the already-obtained vPOS to communicate with a merchant bank's gateway.

Using the built-in "serial number" certificate and the Test Gateway public key certificate (which is "hard-wired" into the vPOS software), it is possible to securely

download a particular bank's customization applications to a specific copy of the vPOS software . Once the vPOS is appropriately configured, the last stage of customization download is to configure the vPOS so that it only responds to a public key certificate of the merchant's acquirer. This process is illustrated here in the context of a merchant who obtains a vPOS that talks to the VeriFone test gateway, and desires to customize the vPOS to interact with a gateway at a bank. The merchant has purchased a vPOS from a non-bank channel. The version communicates with the VeriFone Test Gateway. The merchant uses the gateway to learn about using vPOS, and to test the integration of his storefront system with his payment system. The merchant also obtains certificates for payment processing from a bank, the merchant bank of choice for the merchant. The merchant is now ready to customize vPOS to talk to the bank gateway. The flowchart for the merchant interaction with the Test Gateway is shown in Figure 50.

The merchant begins at function block 5000, where the newly-obtained merchant SET certificates are installed in the vPOS. The merchant then directs the vPOS to connect to the VeriFone Test Gateway, by selecting this option from the vPOS terminal administration home page 5005. The choice of this option invokes an extended terminal admin page from the default set of such pages supplied with the generic version of vPOS. This program guides the customization process. The merchant, interacting with the extended terminal admin page, navigates to the list of gateways which is maintained by the Test Gateway, and selects the bank to connect by selecting from the list of banks, at function block 5015. During this process, the merchant's public key certificates are uploaded to the Test Gateway, and checked (at decision block 5025) to verify that the certificates have been signed by the bank to customize the bank for the vPOS. If the certificates do not match, the merchant is advised of the situation in function block 5028, and must select a different bank. If the certificates are not valid SET certificates as detected at decision block 5020, the merchant is advised at function block 5028, and the session terminates. If the certificates are valid and match the selected bank, customization continues at function block 5030. The extended terminal administration program in vPOS receives a list of the customizations from the Test Gateway that must be performed to specialize the vPOS for a specific bank. Some of these customizations are mandatory, while others are optional. In function block 5030, the vPOS advises the merchant of the customizations, prompting for any choices that must be made by the merchant. The merchant's actions at this point drive decision block 5035, in which the vPOS either returns itself to the "generic" state and terminates the

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interaction, or begins the configuration of the vPOS, depending on the merchant's confirmation of the request to begin the configuration. If the merchant has authorized the changes, control is passed to function block 5040 where, the POS stores the certificates of any gateways that it will allow future configuration changes to be initiated from in its database. This may be only a specific bank, such as a bank and the Test Gateway, or other combinations. If only a single, non-Test, bank-owned, gateway is allowed to download changes, the vPOS is no longer customizable for any other bank. Then, a new copy would be purchased by the merchant to have it customized for another bank. If the Test Gateway is still allowed to customize the vPOS, the merchant could switch to another merchant bank and have the current vPOS updated to work with the new bank. In function block 5050, the customizations are downloaded to the vPOS. The downloads comprise a set of HTML pages and a set of executable programs or scripts that read data from the merchant, perform various functions, and present data to the merchant. In general, the customizations downloaded may augment or replace in part or in whole any and all of function blocks 1822, 1824, 1826, 1828, 1830, or 1834 in Figure 18A. At a minimum, the terminal "home page" will be replaced so that it points to the new functionality. At this point, the customization of the vPOS has been completed, and the merchant may now begin sending payment requests to the merchant bank or processor through the vPOS.

Thread Safe vPOS - TID Allocation

Physical terminals process a single transaction at a time since clerks are usually only able to process one transaction at a time. Web Servers can process many transactions at a time, so payment requests can often occur simultaneously. Thus, the vPOS Software must have support for multi-tasking and provide support for multiple threads to be active at the same time in the same system as well as the same process. This requirement is relatively straight forward. However, the authorizing banks require that all transaction requests include a Terminal ID (TID), and, for many banks, no single TID may be active in any two transaction requests that overlap in time. Thus, the vPOS requires dynamic allocation of TIDs to requesting threads. One way of providing for multiple TID's is to assign a "base" TID, and either an "extension" (a set of extra digits appended to the base), or an increment (a number which is added to the base to obtain the complete TID). While such a solution can be used for the majority of banks and processors, not all banks/processors can accommodate this solution. One example is First Data Corporation. For its ENVOY protocol, the terminal ID must use the Luhn check as

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recited in an ISO ransrk, which adds a checksum digit to the the terminal ID to reduce chances of fraud or of mistyped information. Thus, to be general enough to handle all bank/processor situations, a pool of TID's is used. The TID's stored in the pool need not be a sequential set of numbers; in fact they can be

5 alpha/special/numeric combinations, and the TID's need have no relation to one another. In a preferred embodiment, a TID is represented as a token in a pool that can be associated with a particular transaction. To provide for this requirement, the vPOS provides a TID pool in tabular form in a database management system (DBMS). This table has two columns: TID NAME & Allocation date/time. If the TID

10 date is null, then the TID is not in use and may be assigned. A date/time field is utilized to allow TID allocations to expire. TID requests are made utilizing a SQL query on the TID Pool to find the first null or expired date/time, which is replaced with the current date/time and the TID name returned.

15

REMOTE vPOS

The unique architecture of the Cardholder 120, Merchant 130 and Gateway 140, as shown in Figure 1B, provides communication capability between the modules utilizing the Internet to support linkages 150 and 170. Since the Internet is so pervasive, and access is available from virtually any computer, utilizing the Internet

20 as the communication backbone for connecting the cardholder, merchant and access to the authorizing bank through a gateway allows the merchant vPOS software to be remotely located from the merchant's premises. For example, the cardholder could pay for goods from any computer system attached to the Internet at any location in the world. Similarly, the merchant vPOS system could be located at a central host

25 site where merchant vPOS systems for various merchants all resided on a single host with their separate access points to the Internet. The merchant could utilize any other computer attached to the Internet utilizing a SSL or SET protocol to query the remote vPOS system and obtain capture information, payment administration information, inventory control information, audit information and process customer

30 satisfaction information. Thus, without having to incur the overhead of maintaining sufficient computer processing power to support the vPOS software, a merchant can obtain the information necessary to run a business smoothly and avoid hiring IS personnel to maintain the vPOS system.

vPOS Multi-Merchant Processing

35 Multiple merchant processing refers to the ability of a plurality of merchants to process their individual vPOS transactions securely on a single computer. The architecture relies on each payment page obtaining the merchant name in a hidden

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field on the payment page. The vPOS engine receives the merchant name with a particular transaction and synchronizes the processing utilizing a Set Merchant method. This command causes the vPOS API to look up a unique registry tree based on the merchant name. This process causes the vPOS engine to engage the

5 appropriate configuration to process the transaction at hand utilizing a Registry Tree. A registry tree contains Card Definition Tables (CDT)s, Acquirer Definition Tables (ADT)s, Merchant Definition Tables (MDT)s, Protocol Configuration Tables (PCT)s, etc. The CDTs point to specific ADTs since each supported card can be supplied by a distinct acquirer. This is one form of split connection. Each of the

10 ADTs in turn point to PCTs, and some acquirers can support multiple parallel gateways. A merchant's name refers to a unique database in the database management system which contains for example, TIDs. So, for example, to fully qualify a particular merchant in a multi-merchant system, the Acquirer Definition Table is queried to ascertain the particular Gateway (VFITest), then if Bank of

15 America requires verification of network communication information, the particular CardDT is accessed with for example VISA. The particular merchant will service VISA transactions utilizing a particular acquirer. The particular piece of merchandise will also be detailed in a data base. Finally, the merchant Configurations will also be stored in the database to facilitate E-mail and name

20 lookup.

vPOS CLIENT

The interaction between the vPOS and a client commences when a pay page solicits parameters of a transaction. Then, the parameters are validated to be sure the

25 payment instrument, for example, cardnumber is not null. Then, a transaction object is created, eg. AUTHONLY, and the object is initialized and stuffed with parameters of the transaction, eg. ao.setpan(accnum), and the object is executed. This execution invokes the vPOS engine. The vPOS engine further validates the parameters based on the particular merchant's configuration. For example, some

30 merchants do not accept American Express Cards, but will take Visa, and all merchants check the expiration date of the card. Assuming a valid and acceptable card has been tendered, then a TID is assigned (expiring, existing TIDs) or block a new TID from the TID Pool. This generates a STAN, XID, RRPID unique tag and creates an initial record in the transaction database which is flagged as before

35 gateway processing in case the transaction crashes and must be backed out. Then the protocol parameters are identified in the registry based on card type, and a particular acquirer identified. Then, a protocol object is created and executed to

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extract results from the protocol object and the before gateway "bit" is flipped to again flag the location of the transaction in the process as it is submitted to the Gateway. The results received back from the Gateway are placed into a transaction object with is reported back to the pay page and ultimately back to the pay page user.

vPOS Merchant Pay Customization

A novel feature of the vPOS software provides payment page customization based on a merchant's preferences. This feature automatically lists cards that are accepted by a particular merchant based on the active terminal configuration. Each approved card for a particular merchant is linked to the display via an URL that provides a pointer to the credit card information supported by the merchant. Each card has an entry in a data structure referred to as the Card Definition Table (CDT). A preferred embodiment of the vPOS merchant pay customization software in accordance with a preferred embodiment is provided in Figure 19 which illustrates the logic utilizing a flowchart, and a listing of the source code below. Processing commences at terminal 1900 and immediately flows to function block 1910 where an index variable is initialized for stepping through each of the accepted payment instruments for the merchant's page. Then, at function block 1930, a URL key is obtained associated with the current merchant pay page and index value. The URL key is a registry key name that points to a picture of a credit card that the merchant has associated with the pay page and which the merchant accepts as payment. At output block 1940 the card image associated with the URL key is obtained and displayed on the terminal. The CDT entry is obtained at function block 1950 utilizing the URL key. The CDT is utilized for storing information associated with each card. Then, at decision block 1960, a test is performed to determine if the last payment method card has been processed and displayed on the merchant display. If not, then the index is incremented at function block 1920 and the loop reiterated to process the next card at function block 1930. If all the cards have been processed, then control is returned to the merchant program for processing the transaction at terminal 1970.

Figures 20A through 20H are block diagrams and flowcharts setting forth the detailed logic of thread processing in accordance with a preferred embodiment. Figure 20A illustrates a prior art approach to POS processing utilized in most grocery stores and department stores today. POS Terminal 2001 accepts transactions provided to it one at a time by customers 2000. For each transaction,

POS Terminal **2001** builds a transaction request **2002** and transmit it to acquiring bank **2004** over communications link **2003**.

Figure **20B** is a data structure **2002** representing a POS transaction request in accordance with a preferred embodiment. The data structure **2002** includes a TID field **2005**, which identifies the physical terminal from which the transaction originates. In addition to the TID field, the data structure also includes other data **2006** necessary to process a transaction. This data includes such fields as a transaction type, a transaction amount, a currency type (such as U.S. dollars), credit card account number, credit card expiration date, etc.

Figure **20C** illustrates a vPOS architecture with account requests being processed by a single acquiring bank. vPOS **2007** processes a plurality of customers **2000** concurrently. For each such customer **2000**, vPOS **2007** builds a data structure **2010**, representing the transaction to be performed for that customer. Each data structure **2010** contains a unique "virtual terminal" ID. vPOS **2007** selects a virtual terminal ID using database **2008**. For each data structure **2010**, vPOS **2007** initiates communication with acquiring bank **2004** using communication link **2003**.

Figure **20D** is a data structure **2010** representing a vPOS transaction request in accordance with a preferred embodiment. The data structure **2010** includes a TID field **2012**, which identifies a virtual terminal ID associated with a particular transaction. In addition to the TID field **2012**, the data structure also includes other data **2006** necessary to process a transaction. This data includes such fields as a transaction type, a transaction amount, a currency type (such as U.S. dollars), credit card account number, credit card expiration date, etc.

Figure **20E** illustrates a TID allocation database **2008** in accordance with a preferred embodiment. Database **2008** includes a TID allocation table **2011**. TID allocation table **2011** includes a plurality of rows, one for each TID used by each acquiring bank. One such row **2013** is illustrated in detail. Row **2013** includes a good/service order (GSO) identifier **2014**, which identifies the order being transmitted; a TID field **2015**, which identifies a terminal ID that may be used with a particular acquiring bank; and an acquiring bank field **2016**, which identifies the acquiring bank for which the TID is valid. In addition, row **2013** may optionally include other fields **2017** that may be used in conjunction with the order processing.

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A null GSO value indicates that the TID/Acquirer combination is not currently in use.

Figures **20F** through **20H** are flowcharts of the detailed logic used to perform virtual terminal ID allocation. Figure **20F** illustrates the main line operation of virtual TID allocation. In step **2020**, execution begins. In step **2021**, a skeletal transaction request structure is prepared. In step **2022**, the main line routine obtains a virtual TID for inclusion within the transaction request structure, as will be more fully disclosed with reference to Figure 20G, below. In step **2023**, the routine verifies that a TID was obtained. If the TID was not obtained, for example, if more transactions are currently being processed than there are TIDs, then execution continues to step **2024**. In step **2024**, the transaction request is put on a queue for future processing. In step **2025**, the routine waits for a transaction process to end, which would free up a TID in use. At that point, control resumes from step **2022**, and the routine again attempts to obtain a TID.

If the TID was successfully obtained in step **2023**, control proceeds to step **2026**. In step **2026**, the routine submits the transaction to the acquiring bank. In step **2027**, the transaction is processed. In step **2028**, the routine makes a database call to free up the TID that was used in the transaction. In step **2029**, transaction processing ends.

Figure **20G** depicts in detail the process of obtaining a TID from the database. Execution begins in step **2040**. In step **2041**, the routine constructs a database call to reserve a TID for processing, for example, by constructing an SQL statement to retrieve a TID row from the database. In step **2042**, the routine executes the database call that was constructed in step **2041**. In step **2043**, the routine constructs a second database call to extract the TID from the row that was reserved in step **2042**. In step **2044**, the database call constructed in step **2043** is executed to obtain the TID. In step **2045**, a return code is checked to verify whether the TID was successfully obtained. If the TID was successfully obtained, control proceeds to step **2046**, which returns to the calling program. If, however the TID was not obtained, control proceeds to step **2047**. In step **2047**, the routine checks to see whether an excessive number of retries have already been attempted. If there have been an excessive number of retries, control proceeds to step **2048**, which exits with an error indication. If there has not been an excessive number of retries, control proceeds once again to step **2043** to retry the extraction operation.

Figure 20H depicts the operation of releasing a TID that had been used in a prior transaction. Execution begins in step 2060. In step 2062, the routine constructs a database call to update the row for the selected TID so that the value for the good and service order is null, thereby indicating that the selected TID is not associated with any good or service order, and is therefore free for reuse. In step 2064, the routine executes the SQL statements constructed in step 2062, thereby releasing the TID for use in future transactions. In step 2069, the routine returns to the calling program.

Default Gateway Configuration

The vPOS is initially shipped enabled to connect to a default gateway with a single instance of a gateway defined that accesses a predefined site for testing of an installation before bringing it online in a production mode. The test installation contacts and converses with an actual gateway that simulates live transactions. After the installation checks out utilizing a set of test transactions, the test gateway downloads the pre-checked customizations to the installation so that it can switch over to the production acquirer. This download processing is enabled in extensions to SET.

Internet Transaction Gateway

Payment methods that issue cards for conducting business utilize four major entities. These entities are the issuer, consumer, merchant and the acquirer. The issuing bank that provides the consumer with a credit card are usually not the same bank as the acquiring bank that serves the merchant. When the consumer utilizes a credit card to pay for a purchase, the merchant swipes the card through the POS terminal which makes a connection to the merchant's acquirer via the telephone network and transmits an authorization request with data read from the magnetic stripe. The acquirer's host processor, depending on the card number, will either perform local processing or switch the request to the correct issuing bank's host processor through the interchange network. In a few seconds, the authorization response is returned to the originating POS indicating either an approval or a rejection. The Internet is a viable infrastructure for electronic commerce. Ubiquitous browser software for the World Wide Web provides around-the-clock access to a large base of information content provided by Web servers. Utilizing a preferred embodiment, consumers using browsers can shop at virtual stores and malls presented as Web pages managed by the merchants' servers. Consumers can

- make purchases and pay for them using credit cards or other digital payment instruments in a secure manner. For such Internet-based payments to be authorized, a "gateway" is necessary at the back end to channel transactions to legacy processors and interchange networks. Figure 21 is a detailed diagram of a multithreaded gateway engine in accordance with a preferred embodiment. Processing commences when a TCP transaction 2100 is received by a HTTPS Server 2102 and parsed to an appropriate Web Adaptor 2104 which posts an encrypted set transaction to the multithreaded gateway engine 2110. The encrypted SET request is received at a decryptor 2120, decrypted into a standard SET transaction and authenticated for converting by the forward converter 2124. Inside the forward converter 2124, decides if the request is an original request, and honest retry attempt or a replay attack. The converted transaction is passed to the socket multiplexor 2130 to communicate via an existing communication link 2140 to a host computer. A security logger 2150 is also utilized for passing security records back via a database server 2160 to a database administration application 2190. A transaction logger 2155 also utilizes the database server 2160 to capture transaction logs in a database 2180. Other system administration tasks 2195 include a web server administration task 2190 which logs web hits in a log 2170.
- Figure 22 is a flow diagram in accordance with a preferred embodiment. Processing flows from customers 2200 that are paying for products over the Internet or other communication medium utilizing HTTPS or other protocols to one or more merchants 2210, 2220 or 2230 to a gateway 2240 which directs transactions to a particular host processor 2250 for authorization processing in accordance with the present invention.

Internet Payment Authorization

- The Gateway is a secure computer system that mediates transactions between the merchants' servers and a payment processor. The Gateway supports secure communications between merchants using the Internet on one side, and a processor using standard secure financial networks on the other side. Between the two interfaces, the Gateway maintains a detailed log of all transactions, whether in-progress, completed, or failed. The Gateway accepts transactions from merchants and converts them into legacy compatible formats before forwarding them to the host processor. Responses from the host, after the reverse conversions, will be returned to the originating merchants.
- The Gateway performs many functions, including:

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- Receives encrypted credit card transactions from the merchants via the Internet
- Unwraps and decrypts transactions
- Authenticates digital signatures of transactions based on certificates
- 5 • Supports all transaction types and card types
- Accepts concurrent transactions from each of the merchant servers
- Converts transaction data to legacy formats; forwards the mapped requests (in the clear) to a payment processor over existing communication links
- Converts transaction responses, correlates them with the original requests, and sends the mapped responses back to the merchants
- 10 • Provides logging, monitoring, reporting, and system administration

Figure 23 illustrates a Gateway's 2330 role in a network in accordance with a preferred embodiment. The Gateway 2330 strictly conforms to all SET stipulations regarding certificate management, PKCS signed data encapsulation, PKCS encrypted data encapsulation, ASN.1 representation, DER encoding, MIME encapsulation, and message sequencing. A merchant server 2300 communicates via the Internet 2310 using the SET protocol 2320 through a gateway server 2330 using a network interface processor 2340 to communicate to a legacy network 2360 in, for example the X.25 protocol 2350. The legacy host 2370 ultimately receives and processes the transaction from the merchant server 2300 without modification to its code.

Internet Communication Protocols

As discussed above, the TCP/IP protocol suite is utilized at the transport level. At the application level, in compliance with SET, all requests arrive at the Gateway in MIME encapsulated HTTP format. Similarly, all responses from the Gateway to the merchant servers will be transferred in HTTP. The HTTP protocol stipulates that a request-response pair will go through the same TCP connection and that the originator, in this case a merchant server, will establish a connection to send the request and will take down the connection when it has received the response.

Host Payment Protocols

Message conversions performed by the Gateway will be significantly more than format transliterations: per-protocol differences in data elements and message semantics must be considered carefully. Some of the transaction types that are supported are listed below.

Transaction Types
Credit card sale with capture
Credit card sale without capture
Credit card sale with capture including AVS (MasterCard and VISA)
Credit card sale without capture including AVS (MasterCard and VISA)
Credit card return (Credit)
Credit card post authorization (Force Post)
Credit card post authorization (Force Post) with partial reversal support, enhanced authorization data, and AVS result code (VISA)
Credit card sale with capture - Void
Credit card return (Credit) - Void
Totals request (for balancing)

Host Communications Protocols

A virtual, private network between the Gateway and the host processor is established to expedite host communication. In addition, two Network Interface Processors (NIP)s – a “near end” NIP that interfaces to the Gateway and a “far end” NIP that interfaces to the host. The NIPs will handle virtual connections between themselves. The far-end NIP will take care of specific communication details. The near-end NIP is an IP-addressable device that converts between TCP messages and packets. It is installed on a public network 2330, which is a LAN outside the corporate firewall. The Gateway, on the secure public network 2330, utilizes TCP/IP 2320 to communicate with the near-end NIP.

GATEWAY FEATURES

Because the Gateway must sustain reliable operations and enable graceful evolution, it is designed with some important attributes, including: Security, Availability, Performance, Scalability, and Manageability.

Security

Channel Security

At the application level, SET provides signed and encrypted data encapsulations of payment information portions of the transaction messages. Transport-level encryption of the entire message packet is required for additional security. The HTTPS protocol – i.e., HTTP over SSL 3.0 – is utilized between the merchants and the Gateway. The virtual connections between the near-end NIP and the host are part of a private network. The termination will occur outside the firewall. Data between the

Gateway and the host is sent in the clear with no encryption. In this network configuration, a transaction between a merchant's vPOS and the host will cross the firewall four times: SET request from vPOS to Gateway, legacy request from Gateway to NIP, LEGACY response from NIP back to Gateway, and SET response from Gateway back to vPOS.

Certificate Management

Payment Protocol Certificates

The Gateway uses certificates to authenticate the two parties involved in each MOSET transaction. Through a Certificate Authority, one certificate is issued for the Gateway and one certificate for each of the merchant servers.

Secure Channel Certificates

SSL will require separate certificates for the Gateway and the merchants.

Availability

Site redundancy and location redundancy allows the Gateway to sustain service through virtually instantaneous recovery from internal failures or external disasters that cause physical damages to the system. Minimum-outage recovery is possible with redundant configurations of important components.

Site Redundancy

The Gateway supports connections to a proprietary bank network and supports mirrored disk arrays.

Location Redundancy

The Gateway architecture supports location redundancy where a secondary remote system is connected to the primary system via dedicated WAN links for software-driven database duplication.

Scalability

The Gateway software architecture, the choice of third-party software components, and the selection of hardware platforms enable the system to gracefully adapt and evolve to take on new demands in different dimensions.

The Gateway resides on an HP 9000 that is housed in a standard 19" EIA rack.

Gateway Hardware Configuration

Server Hardware Description
K-Class SMP Server - Model K420 - Standard Configuration
120 MHz PA-RISC 7200 CPU
128 MB ECC RAM
Built-in I/O includes Fast/Wide/Differential SCSI-2, EtherTwist 802.3 LAN,

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AUI, RS-232C Connectors, Centronics Parallel Port, and Internal Modem	
650 MB CD-ROM Drive	
HP-UX 10.10 Operating System (with two-user license)	
4 HP-PB Slots	
Additions	
1	SCSI-2 Disk Controller <i>to support disk mirroring over dual SCSI-2 buses</i>
1	2 GB Internal SCSI-2 Disk Drive, 20MB/s transfer rate, not mirrored <i>for systems software and swap space</i>
1	4 GB External High-Availability Disk Arrays <i>for databases - total of 4 x 2 MB modules required</i>
1	4 GB DAT drive with data compression
1	HP-PB Slot Expansion Option <i>provides 4 additional HP-PB slots for peripheral controllers</i>
2	FDDI interface cards (each card uses 2 HP-PB slots)
1	Option for eight-user license for HP-UX

Cryptographic Hardware

The encryption and decryption algorithms used in processing SET/SSL messages require significant computational power. A "security processor" is deployed with the Gateway to boost the performance of cryptographic algorithms. The processor is a networked peripheral device to the HP 9000 server. It provides cryptographic services suitable for SET/SSL processing, and its services are accessible via calls to software libraries running on HP-UX. Figure 24 is a block diagram of the Gateway in accordance with a preferred embodiment.

Gateway Architecture

Operating System Software

The Gateway runs under the HP-UX Version 10.10 operating system and is upgraded to support future significant system releases. HP-UX 10.10 conforms to major standards, including:

- X/Open UNIX 95 (conforming with the Single UNIX Specification, SPEC 1170)
- X/Open Portability Guide Issue 4 Base Profile (XPG4) OSF AES
- IEEE POSIX 1003.1 and 1003.2
- AT&T System V Interface Definition (SVID3 base and kernel extensions subset)

Level 1 API support

- UC Berkeley Software Distribution 4.3 (BSD 4.3) including such features as job control, fast file system, symbolic links, long file names, and the C shell
- System V.4 File System Directory Layout

This compliance with various software standards assures that while a preferred embodiment of the invention is disclosed in association with a best mode of practicing the invention other similar software and hardware environments can be readily substituted without undue experimentation.

Relational Database Management System (RDBMS) Software

The Gateway uses Oracle7 Server version 7.3 as the RDBMS and will be upgraded to use future significant system releases. The multi-threaded, multi-server architecture of Oracle7 provides applications with scalability to high-volume transaction workloads. When deployed with the HP 9000 K-Class platform, Oracle7 performs a symmetrically parallel database operation across all available processors. In addition, Oracle7 includes options for creating high-availability systems:

- The Oracle7 *Parallel Server* option extends the reliability of applications by transparently harnessing the power of clustered computers in a single logical processing complex that can tolerate individual machine failures.
- Oracle7 *Symmetric Replication* provides high data availability. Data can be replicated from the primary system to one or more alternative sites.

HTTP Server

The Gateway utilizes Netscape's Enterprise Server 2.0 as the HTTP server. The server is designed for large-scale Internet commerce deployment, Enterprise Server 2.0 achieves performance and reliability with such features as optimized caching, SMP support, enhanced memory management, and SNMP-based performance monitoring. Efficient process management features minimize system load and increase server reliability. Security features are provided using the SSL 3.0 protocol.

Protocol Stacks

Internet and LAN - The TCP/IP protocol stack will be provided as part of the HP-UX operating system.

Other Application-Level Protocols

Application-level protocols enable client-server interoperability. Each of the following protocols are transported using TCP or UDP.

- **HTML.** HTML will be used to define screens for Gateway system administration.
- **HTTP.** The HTTP layer is part of Enterprise Server 2.0. The server is administered with a Web browser.

- **SQL*Net.** The Gateway's Oracle7 database can be accessed by administration clients using SQL*Net. Administration software can establish database connectivity to retrieve data for generating transaction reports.
- **SNMP.** Enterprise Server 2.0 can be monitored using SNMP. The Gateway
5 utilizes SNMP for remote system management.

Transaction Performance Monitoring and Measurement

- The "hits" performance indicators are available from the Web server. Statistics can be generated at any time to highlight the load pattern or to pinpoint the time when the server was most active.
- Gateway statistics about transaction requests (by transaction type) and transaction results (e.g., success, failed due to host, failed due to authentication, etc.) can be determined at any time for a particular time interval by generating a
10 report.

The Gateway is upgradeable to interoperate with a real-time event monitoring
15 system such as OpenVision's Performance Manager.

Basic Request/Response Mappings

The following table shows the basic request/response mapping between the SET protocol and the LEGACY protocol.

SET Request / Response Pair	LEGACY Request/Response Pair and Transaction Code
AuthReq, AuthRes	LEG/CTR (05)
AuthRevReq, AuthRevRes	LEG/CTR (99)
CapReq, CapRes	LEG/CTR (42 or 44)
CapRevReq, CapRevRes	LEG/CTR (41)
CredReq, CredRes	LEG/CTR (40)
CredRevReq, CredRevRes	LEG/CTR (90)
BalReq, BalRes	CTA/CTL (48)

20

Gateway Analysis for SET Message Handling

This section tackles general design considerations of the Gateway software and is not limited to LEGACY (unless specifically mentioned). The complete functional
25 behavior of the Gateway will be described in a separate document.

Replay Attack Handling

A replay attack at the Gateway is a request where either:

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- a) the request is *stale*; the request was received "too late"-with respect to the *reqdate* in the request. This window is specified by a configurable Gateway policy.
- b) the request is not stale but the exact *rrpid* (Request/Response Pair Id) has already been seen before in a request and still logged in the Gateway database. The *<xid, mid, rrpId>* tuple will be the primary key that determine whether a request had already been received. This will allow the possibility of the same *rrpid* to be generated from the same merchant but for a *xid* and also allow the same *rrpid* to be generated by a totally different merchant.

New Attempt vs. Retry Attempt

It is possible that messages sent between the vPOS and Gateway may be lost in transit. This could happen either because of hardware/software problems in the Internet or for hardware/software reasons local to the Gateway or Merchant System. The question is then "How does a Gateway recognize an honest retry attempt from an initiator?" First a little background into the nature of a SET request. All SET requests have the following fields:

<i>xid</i>	merchant's transaction id
<i>mid</i>	merchant id (contained in certificate)
<i>tid</i>	terminal id (from Merchant System)
<i>rrpid</i>	request response pair id
<i>reqdate</i>	request date (from Merchant System)
<i>reqdata</i>	request specific data

Let the following tuple represent a generic SET request:

<xid, mid, tid, rrpId, reqdate, reqdata>

The merchant establishes the *xid* during the shopping phase with the consumer.

The same *xid* is used for both the *AuthReq* and the *CapReq* and subsequent

CreditReq requests. Using the same *xid* for many requests makes it impossible for the Gateway to distinguish between repeated transactions vs. new transactions.

For example, how could a Gateway possibly determine whether two valid *CredReq* requests were to be interpreted as two individual credits or a retry of a single request.

request 1: *<xid₁, mid_m, tid_i, rrpId₁, reqdate₁, reqdata₁>* (perhaps a *CredReq* for \$10.00)

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request 2: $\langle xid_1, mid_m, tid_1, rrp_{id_2}, reqdate_2, reqdata_1 \rangle$ (perhaps a new *CredReq* for \$10.00)

could also be interpreted as...

5 request 1: $\langle xid_1, mid_m, tid_1, rrp_{id_1}, reqdate_1, reqdata_1 \rangle$ (perhaps a *CredReq* for \$10.00)

request 2: $\langle xid_1, mid_m, tid_1, rrp_{id_2}, reqdate_2, reqdata_1 \rangle$ (perhaps a retry of above)

10 The *reqdates* are different in both cases because the date is generated along with the *rrpid* to thwart replay attacks. In this example the Gateway will not be able to determine whether the second *CreditReq* should be performed or whether it is simply a retry to request 1 with *rrpid*₁. The Gateway must know whether or not to apply a new credit or to deliver a response that it may already have from the host (it may
15 have come too late for the first attempt or have been lost on the way to vPOS). If no response was logged from the host for request 1, the Gateway could repeat its original request to the host when receiving request 2. In a sense, the Gateway will act as an **intelligent request/response cache**.

20 The Gateway splits the *rrpid* number space into two parts. One main part that will remain the same for the same request across all its retry attempts and a smaller portion to indicate the number of retry attempts. Then,

25
$$rrpidRetryCount \equiv rrp_{id} \text{ MOD } MAXRETRIES \text{ (0 for initial request, } >0 \text{ for a retry)}$$

NOTE : The initial *rrpids* generated by vPOS software are equal to 0 MOD MAXRETRIES and in subsequent retries the lower order digits are incremented by one for each retry attempt. This requires extra stored in the vPOS application. The
30 vPOS software must persistently store the *rrpid* used (which contains the retry count of the transaction) so that repeated attempts will follow the correct semantics.

In general the Gateway will support the following logic [assuming the second request is fresh and not a replay attack]:

35 If two requests,

request 1 : $\langle xid_1, mid_m, tid_1, rrp_{id_1}, reqdate_1, reqdata_1 \rangle$

request 2 : $\langle xid_1, mid_m, tid_1, rrp_{id_2}, reqdate_2, reqdata_1 \rangle$

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are received at t_1 and t_2 (where $t_2 > t_1$) and,

$$(\text{rrpid}_1 - (\text{rrpid}_1 \bmod \text{MAXRETRIES})) \equiv (\text{rrpid}_2 - (\text{rrpid}_2 \bmod \text{MAXRETRIES}))$$

then the Gateway will interpret the second request as a retry request.

But if,

$$5 \quad (\text{rrpid}_1 - (\text{rrpid}_1 \bmod 100)) \neq (\text{rrpid}_2 - (\text{rrpid}_2 \bmod \text{MAXRETRIES}))$$

then the Gateway will interpret the second request as a new request.

10 In addition to being able to distinguish between a retry and a new request, the proposed *rrpid* scheme can be used to determine how many vPOS requests got lost in the Internet. This is a useful value-added service for system management.

Robustness and Error Handling Issues

15 There are several robustness issues that need to be addressed. The basic flow is that vPOS sends a request to the Gateway, the Gateway logs the SET key fields from the incoming attempt in the database. The Gateway then generates a host request which it logs completely in the database. The host handles the request and generates a response that is directed towards the Gateway which, when received is logged completely in the Gateway database. Finally the Gateway generates an SET response to vPOS, the contents of which is not logged in the database.

20 If the Gateway has not received the request or receives the request but is not able to log the request in the database it is easily handled by a vPOS retry attempt. This recovery action needs no further discussion. In general, if the vPOS does not receive a reply to a request it has sent to the Gateway it must retry persistently until a response is received. All retry attempts from vPOS for the same request must have
25 the same base portion of the *rrpid* but a different value in the retry counter.

The Gateway must handle replay attacks as outlined previously in this document. If the Gateway receives a request that it has already received from vPOS there could be several possible dispositions:

- 30 a) the request had already been handled completely with the host and a host response is in the Gateway database. In this case the Gateway can simply translate the host response to a SET response and send it to vPOS.
- 35 b) the request had been sent to the host before (as determined by a database field) but a response from the host is not on file. In this case the Gateway must retry the host request.

If the vPOS times-out for any reason, it must retry later using an *rrpid* that indicates a retry attempt. If the Gateway receives a late-response (after vPOS has given up) it simply logs it in the database for that retry attempt (if no retry attempt for the transaction is still outstanding at the host). There is a glare situation where
5 the original response could arrive so late that it could be confused with the response from a currently outstanding retry attempt with the host. This situation is logged and the first response not sent back to vPOS.

A response from the host indicating a successful transaction may get lost on the way
10 back to the Gateway or not be able to be logged in persistent storage in the Gateway. In either case vPOS is in a situation where the retry request when received by the host may result in a response from the host indicating that the request is a duplicate. The vPOS software must be able to handle this. In the LEGACY case when a duplicate post is received by the host the second one automatically causes
15 the first one to void and the second transaction fails too. In this case vPOS should retry the transaction under a new *rrpid*. If the transaction goes through end-to-end all effects of the previous transactions will not matter.

TokenOpaque Contents

20 The Gateway requires information captured at the time of an *AuthReq* that must be repeated to the host at the time of the associated *CapReq*. The mechanism of choice (built into SET) for this is enabled utilizing this data in the *TokenOpaque* token of the *CapToken* which is sent in an *AuthRes*. This *CapToken* is stored at the Merchant system and represented to the Gateway at the time of the *CapReq*. The format of an
25 *TokenOpaque* is an *OctetString*.

The following data structure is utilized to deliver the AVS data.\

```
30      StreetAddress1=800 El Camino Real\n      StreetAddress2=Suite 400\n      City=Menlo Park\n      StateProvince=CA\n      Country=USA\n      PostOfficeBox=\n35      ZipPostalCode=94025\n      \n
```

An empty line indicates the end of *AVSData*.

The detailed information that is available for the Address Verification Service depends on the Payment Window that captures the data from the consumer.

5 AVS Data (LEGACY-only)

For "LEGACY" version "1.0" only the *ZipPostalCode* name value pair is required. The Gateway will only use the first 5 characters of this value.

Transaction Replay Attacks

- 10 The processing of Internet-based payment transactions is a coordinated interaction between the Internet Transaction Gateway and the vPOS servers that is based on the following principles. A vPOS terminal, as the initiator of the payment transaction, is responsible for the round-trip logical closure of the transaction. vPOS will retry a transaction that has been initiated with the Gateway but where the response for the
- 15 request was never received from the Gateway. A vPOS terminal selects -- out of a pre-assigned range -- a ***Terminal-Id*** that is to be used by the Gateway in a request to the host processor. This data element must be transported from the vPOS to the Gateway along with the payment-related information. The ***Terminal-Ids*** must be unique among the concurrent vPOS instances on a vPOS server system. However,
- 20 the ***Terminal-Ids*** have no history. For example, a subsequent Force Post transaction need not use the same ***Terminal-Id*** as the original Authorization transaction. The vPOS will be responsible for making sure that only one request is outstanding for the same ***<Merchant-id, Terminal-id>*** data elements from a vPOS server system. The Gateway does not know that a response was successfully
- 25 received by vPOS. This means that the vPOS must be responsible for initiating any retry attempts. The Gateway never initiates a retry attempt with the host processor without an explicit retry request from vPOS. The Gateway when asked to retry a request with the host, performs a relational database look-up and delivers a response that has already been received from the host processor but was previously
- 30 missed by vPOS. This behavior of the Gateway is also known as the "transaction response cache." The Gateway will need to know that a vPOS request is a retry of something already sent. The prior request may or may not have been received. A solution for determining the difference between a retry attempt and a new request was described earlier in this document. vPOS must understand the "canonical" error
- 35 codes that it will receive via the Gateway and be able to initiate the proper recovery action and/or generate the appropriate user-interface dialog.

Certificate Processing

Merchants require a mechanism for verifying legitimate cardholders is of valid, branded bankcard account numbers. A preferred embodiment utilizes technology to link a cardholder to a specific bankcard account number and reduce the incidence of fraud and thereby the overall cost of payment processing. Processing includes a mechanism that allows cardholder confirmation that a merchant has a relationship with a financial institution allowing it to accept bankcard payments. Cardholders must also be provided with a way to identify merchants they can securely conduct electronic commerce. Merchant authentication is ensured by the use of digital signatures and merchant certificates. In a preferred embodiment, a holder of a payment instrument (cardholder) surfs the web (Internet) for required items. This is typically accomplished by using a browser to view on-line catalog information on the merchant's World Wide Web page. However, order numbers can be selected from paper catalogs or a CD-ROM and entered manually into the system. This method allows a cardholder to select the items to be purchased either automatically or manually. Then, the cardholder is presented with an order form containing the list of items, their prices, and totals. The totals could include shipping, handling and taxes for example. The order form is delivered electronically from the merchant's server or created on the cardholder's computer by electronic shopping software. An alternative embodiment supports a negotiation for goods by presenting frequent shopper identification and information about a competitor's prices. Once the price of goods sold and the means of payment has been selected, the merchant submits a completed order and the means for payment. The order and payment instructions are digitally signed by cardholders who possess certificates. The merchant then requests payment authorization from the cardholder's financial institution. Then, the merchant sends confirmation of the order, and eventually ships the goods or performs the requested services from the order. The merchant also requests payment from the cardholder's financial institution.

Figure 1C is a block diagram of a payment processing system in accordance with a preferred embodiment. The Certificate Issuance at the Bank Web Site 162 resides at the bank web site 182. It is utilized for issuing SET complaint / X.500 certificates to consumers. The implementation of this system may vary from one bank to another. However, the system gathers consumer's personal information, and after processing the information, the system issues a certificate along with a payment instrument to the consumer. The Single Account Wallet 160 at the bank web site 182 represents the MIME message that is created by the Certificate Issuance system. This MIME

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message contains a VeriFone wallet. The VeriFone wallet contains a single payment instrument and the certificate associated with it. For security reasons, the private key is not included in the wallet. The has to specify a private key before using the instrument for payment. When the consumer is issued the certificate, this MIME message is sent to the browser. The browser launches the Certificate Installation application 174, 144 which is defined as a helper application in the browser. The Certificate Installation application 174, 144 reads the MIME message and install the wallet into the wallet database 158.

Various helper applications 198, 172, 174, 176 are provided to make the consumer's shopping experience easy and efficient including the following helper applications. The Paywindow helper application 188 is utilized by the consumer to authorize the payment to the merchant, to administer their wallets, to review their previously completed payment transactions and to perform housekeeping activities on the wallets. This application is defined as a 'helper' application on the consumer's desktop. The browser launches this application when the merchant system sends a MIME message requesting payment. The PayWindow Setup Helper application 172 is used by the consumer to install helper applications and other modules from the web site onto the consumer desktop. When a consumer attempts to install an application for a first time, the consumer does not have a helper application on the desktop. Thus, the first time installation of an application requires a consumer to perform two steps. First the user must download the system package to their desktop and then the user must run setup to decompress and install the system. Thereafter, whenever the consumer gets a new release of system software, the browser launches this helper application which in turn installs the appropriate other system modules.

The Certificate Installation Helper Application 174 is utilized to install a wallet that is issued by a bank. When the bank's certificate issuance web system sends the MIME message containing the VeriFone wallet, the browser launches this application. This application queries a consumer to determine if the payment instrument contained in the wallet is to be copied to an existing wallet or to be kept in the new wallet. This application then installs the payment instrument and the certificate into the wallet database 158. The Certificate Issuance CGI scripts 162 and the Single Account Wallet 160 at the Bank Web Site 182 is processed as described in the native system. The Certificate Installation Applet of the Bank Web

Site **182** is utilized by the Certificate Issuance CGI scripts **162** system to deliver a consumer's certificate to the consumer's desktop.

Figure **26** is an architecture block diagram in accordance with a preferred embodiment of the subject invention. Processing commences at function block **2600** where the Graphical User Interface (GUI) part of the application is initialized. The GUI application **2600** provides the consumer with support for ordering and making payments during the shopping process. There are also GUI components provided for wallet creation; importing, certificate and payment method creation and maintenance; and for transaction register review and reporting. The screen designs, and their associated logic, for the helper applications and applets are individually discussed in detail below. The Certificate Manager **2604** manages the automatic downloading of a consumer's certificate from a bank, validation of a consumer's and a merchant's certificates and automatic requisition of certificate renewal. The Payment Manager **2606** coordinates and completes the payment request that is received from the merchant system. The payment request is received via a MIME message in the native code implementation or via an applet in the Java implementation. The payment request received contains the final GSO, Ship-To name, merchant certificate, merchant URL, coupons and the payment amount. The manager **2606** then communicates with the payment related GUI component to interact with the consumer to authorize and complete the payment transaction. The manager is also responsible for determining the payment protocol based on the consumer's payment instrument and the merchant's preferred payment protocol. The manager **2606** includes a well defined Application Programming Interface (API) which enables OEMs to interface with the payment manager **2606** to make payments to specific HTTP sites. The detailed logic associated with the payment manager **2606** is presented in Figure **27**. The payment manager **2606** enforces standard operations in the payment process. For example the receipt and the transaction record can automatically be transferred to the Wallet file once the payment is completed. The payment manager architecture in accordance with a preferred embodiment is presented in Figure **27**. A user interfaces with the payment manager **2730** via a user interface **2700** that responds to and sends a variety of transactions **2710**, **2708**, **2706**, **2704** and **2702**. The transactions include obtaining the next record, payment record, receipt, acceptance of the payment instrument and GSO components. In turn, the payment manager **2730** sends transactions **2714** and receipts **2720** to the wallet manager **2722** and receives payment instruments, certificates and private keys from the wallet manager **2722**.

The payment manager **2730** also sends and receives transactions to the protocol manager **2770** including a merchant's payment message **2760**, a consumer certificate and PK handle **2750**, a merchant URL **2742**, a payment **2740**, a signed receipt **2734** and a GSO, Selected Payment Protocol and Selected Payment Instrument **2732**. The payment manager **2730** also accepts input from the payment applet or MIME message from the merchant as shown at function block **2780**. One aspect of the payment processing is a Consumer Payments Class Library (CPCL) **2770** which encapsulates the payment protocols into a single API. By encapsulating the payment protocols, applications are insulated from protocol variations. A SET Protocol provides an implementation of the client-side component of the Secure Electronic Transaction (SET) Protocol. A complete implementation of the client-side component of the CyberCash micro-payment protocol is also provided.

The Wallet Manager **2722** provides a standard interface to the wallet. It defines the wallet database structures and the payment instrument data structures, controls the access to the wallet and provides concurrency checking if more than one application attempts to open the same wallet. The interface to the wallet manager **2722** is published to allow OEMs to interface with the wallet manager and access the wallet database.

The wallet manager consists of the following sub-components:

Wallet Access. This component provides an interface to read and write wallet information.

Transaction Manager. This component provides an interface to read and write transaction corresponding to a wallet into the wallet database.

Payment Instrument Manager. This component manager provides a common interface to the specific payment instrument access components.

Credit Card Access, Debit Card Access, Check Access. These components deal with a specific payment instrument.

A Data Manager provides storage and retrieval of generic data items and database records. It is assumed that data fields, index fields or entire data records can be marked as encrypted and the encryption process is largely automated. The data manager has no specific knowledge of database records appropriate to different payment methods. This layer is separated out so as to reduce changes required when new payment methods are introduced. However RSA key pairs and certificates might be considered as "simple" data types. This component also provides an

abstraction which supports wallet files on computer disk or contained in smart cards.

5 The Open Data Base Connectivity (ODBC)/Java Data Base Connectivity (JDBC) component provides Data Base Connectivity where formal database components are required. An embodiment of the Smart Card Wallet allows wallet data to be stored and/or secured by a cryptographic token.

10 A preferred embodiment includes a single file or directory of files comprising a "wallet" which contains personal information and information about multiple payment methods with the preferred implementation. These payment methods (Visa cards, debit cards, smart cards, micro-payments etc.) also contain information such as account numbers, certificates, key pairs, expiration dates etc. The wallet is envisaged to also contain all the receipts and transaction records pertaining to every
15 payment made using the wallet. A Cryptographic API component provides a standard interface for RSA and related cryptographic software or hardware. This support includes encryption, signature, and key generation. Choice of key exchange algorithm, symmetric encryption algorithm, and signature algorithm should all be configurable. A base class stipulates generic behavior, derived classes handle
20 various semantic options (e.g. software based cryptography versus hardware based cryptography.)

The Cryptographic Software portion provides RSA and DES support. This may be provided utilizing the SUN, RSA or Microsoft system components depending on the
25 implementation selected for a particular customer. Cryptographic Hardware creates a lower level API which can underpin the Cryptography API and be utilized to replace Cryptography Software with an off the shelf cryptography engine. The message sequence charts describe the flow of messages/data between the consumer, the browser and/or the various major components of the Semeru system. The major
30 components of the system are the Merchant system which includes the vPOS, the PayWindow, and the Payment Gateway. The merchant system allows a consumer to shop, accept the payment transactions sent by the PayWindow application, and send payment transactions to the acquiring bank. The Consumer Payments Class Library (CPCL) module is a layer within the application which sends the payment
35 transactions, securely, from the consumer to the merchant.

Figure 28 is a Consumer Payment Message Sequence Diagram in accordance with a preferred embodiment of the invention. The diagram presents the flow of messages between the consumer, the browser, the merchant system, the PayWindow application, and CPCL. This message flow describes the payment process from the time an order is completed and the consumer elects to pay, to the time the payment is approved and the receipt is returned to the consumer. The difference between the Native implementation and Java implementation of the PayWindow application is in the delivery of the order information to the PayWindow. Once the order information is received by the PayWindow, the flow of messages/data is the same for both implementations. In the case of the Native implementation, the order information is delivered via a MIME message. This MIME message is sent to the PayWindow by the browser via a document file. In the Java implementation, the order information is delivered to the PayWindow by an applet. The merchant system sends an applet with the order information to the browser which in turn delivers the order to the PayWindow. Once the order is received, the PayWindow interacts with the consumer and the Protocol modules for the completion of the payment process.

Enters Order and Clicks Calculate Order 2820

This message represent the consumer order entry and the clicking of the 'Calculate Order' button. The consumer's shopping experience is all condensed into this one message flow for the purpose of highlighting the payment process. The actual implementation of the shopping process varies, however, the purpose does not, which is the creation of the order.

Order 2830

This message represents the order information which is sent by the browser to the merchant via an HTML form.

Payment Applet with GSO, PPPs, AIs, merchant certificate and URL 2840

On receipt of the order, the merchant system calculates the payment amount. This message represents the HTML page which is sent by the merchant system detailing the payment amount along with the Java payment applet which contains the GSO, PPPs, AIs, merchant certificate and URL.

Run Payment Applet 2845

The Java enabled browser runs the Payment applet. The applet displays a button called "Pay" for the consumer to click. This is embedded in the HTML page delivered by the merchant.

Clicks Pay 2850

This message represents the clicking of the Pay button on the browser by the consumer after confirming the payment amount.

GSO, PPPs, AIs, merchant certificate and URL 2860

This message represents the GSO, PPPs, AIs, merchant certificate and the merchant URL carried by the Java applet. The Java applet now delivers these to the PayWindow application.

5 Merchant certificate 2862

This message represents the merchant's certificate which is sent to the CPCL module for checking the validity of the merchant.

Merchant's validity 2864

10 The CPCL modules examines the merchant's certificate and send this message to the PayWindow indicating whether or not the merchant is a valid merchant.

Wallet, Payment Instruments 2866

This message represents the wallets and payment instruments that is displayed to the consumer. Not all payment instruments from a wallet is shown to the consumer. Only the ones accepted by the merchant is shown.

15 Payment Instrument 2868

This message represents the payment instrument selected by the consumer. This message is created in the current design when the user double clicks on the payment image in the "Select Payment Method" Window.

GSO 2870

20 This indicates that the GSO is displayed to the consumer in the "Make Payment Authorization" screen.

Authorization of Payment 2872

This message represents the authorization of the payment by the consumer. The consumer authorizes the payment by clicking the 'Accept' button on the "Payment Authorization" screen.

25 Decide Payment Protocol 2874

Once the consumer authorizes the payment, the payment protocol is decided by PayWindow based on the merchant's Payment Protocol Preferences and the consumer selected payment instrument.

30 Payment Authorization 2875

These messages represent the merchant's URL, the GSO, payment protocol (PP) to use, account number, certificate and the private key handle (PK) associated with the payment instrument which is sent to the protocol module.

GSO with Payment Authorization 2876

35 This message represents the payment instructions which is sent by the protocol module to the Merchant system. The GSO, PI, consumer certificate and PK is packaged based on the payment protocol.

Signed Receipt 2878

This message represents the digitally signed transaction receipt received by the protocol module from the merchant.

Save Receipt with hash value 2880

- 5 The digitally signed transaction receipt is saved by the PayWindow for future reference.

Payment Successful 2882

This indicates that the transaction receipt and the 'payment successful' have been displayed to the consumer.

10

Certificate Processing

- A payment instrument must be certified by a "certificate issuing authority" before it can be used on a computer network. In the case of credit card payments, the issuer may be one of the card issuing banks, but it might also be a merchant (eg SEARS), a transaction acquiring bank or an association such as VISA or Mastercard. Payment instrument information is stored in the consumer's wallet. The certificate which authorizes the payment instrument will be stored along with that data in a secured database. The process of acquiring a certificate is described below. A certificate can be delivered to a consumer in a preconfigured wallet. The consumer receives a wallet which contains the certificate together with the necessary details associated with a payment instrument including a payment instrument bitmap which is authorized by a certificate issuing authority or the agencies represented by the issuing authority.
- 15
- 20

Obtaining a certificate

- 25 A consumer will deliver or cause to be delivered information to a certificate issuing authority. Figure 29 is an illustration of a certificate issuance form in accordance with a preferred embodiment. A user may fill out the form on-line, on paper and mail it in, or get his bank or credit card company to deliver it. The consumer delivered data will usually contain a public key belonging to a security key pair generated by consumer software. This information will normally be mailed to the consumer's address and actuated by a telephone call from the consumer. The certificate authority takes this information and uses it to validate that he is indeed entitled to use the payment method. This processing normally takes a few days to accomplish. Information will normally be exchanged with the organization issuing the payment method in the physical space if there is one, and with credit agencies. The certificate information is loaded into the consumer's software to enable payment processing to proceed online. In some cases the consumer will be able to select
- 30
- 35

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details about a payment instrument holder (wallet) he desires to own. This may be the icon representing a holder, the access password or other information. After creating the certificate, the issuing authority can use information received in the certificate application to create a custom payment instrument holder ready to use.

5 This payment instrument holder will contain the following information. Payment instrument information including card number **2900** and expiration date **2902**. Personal information including name **2904**, address **2906**, social security number **2908** and date of birth **2910**. The associated certificate (eg X509 standard), an associated public key or in some cases public/private key pair (eg RSA), and an

10 approved bitmap representing the payment instrument are provided to the requesting consumer. Figure **30** illustrates a certificate issuance response in accordance with a preferred embodiment. An approved bitmap for a VISA card is shown at **3000**. Also a default payment holder **3010** and a default payment holder name are provided with the certificate issuance. After the consumer acquires the

15 payment instrument holder **3010**, the payment instrument holder is immediately visible to him in his collection of payment instrument holders. Figure **31** illustrates a collection of payment instrument holders in accordance with a preferred embodiment. The predefined payment instrument holder **3100** is the same JOHN's WALLET that was predefined based on defaults by the certificate issuance form.

20 Figure **32** illustrates the default payment instrument bitmap **3200** associated with the predefined payment instrument holder **3210** resulting from the consumer filling in and obtaining approval for a VISA card. Figure **33** illustrates a selected payment instrument with a fill in the blanks for the cardholder in accordance with a preferred embodiment. Next time the payment instrument holder is opened in a payment

25 context the certificate issuing authority's approved instrument bitmap can be used to select the payment instrument and utilize it to make purchases. Figure **34** illustrates a coffee purchase utilizing the newly defined VISA card in accordance with a preferred embodiment of the invention.

30 Figure **35** is a flowchart of conditional authorization of payment in accordance with a preferred embodiment. Processing commences at **3500** where the program initializes the connection between the cardholder and the merchant for the purposes of shopping. After the cardholder completes shopping, a new SSL connection is established which provides authenticating information to the merchant. At this point

35 the merchant is able to execute payment functionality (based on SSL or SET) conditionally, based upon the quality and character of the digital signature and the certificate used to validate said signature. Then, at function block **3510**, the

cardholder selects the payment instrument for the particular transaction. Payment instruments could include VISA, MASTERCARD, AMERICAN EXPRESS, CHECK, SMARTCARD or DEBIT CARDS. The payment method is then submitted to the merchant at function block 3520. The merchant then initializes the SET connection to the acquiring bank at function block 3530 if the connection is not already established. Then, at function block 3540, the certificate is submitted to the merchant from the acquiring bank. The certificate includes a public key portion and a private key used as an irrefutable digital signature to authenticate the parties to the transaction. The certificate also includes information on the level of credit risk which allows a merchant to conditionally decide on the authorization or rejection of credit under a particular payment instrument based on their risk level and the merchant's personal comfort level with the ability of the cardholder to pay. This processing has not previously been possible because the information returned from the authorizing bank did not include a level of credit risk a cardholder posed, it only contained credit rejected or approved. A detailed description of the gateway internals is presented below in accordance with a preferred embodiment.

Gw ClearSetRequestHandler

Figure 51 depicts a flow diagram for the GatewayClearSetRequestHandler routine.

Execution begins in Step 5105. In Step 5110 an SET analysis routine is called to analyze the SET request, as will be more fully disclosed below. Step 5110 sets a status flag indicating the next stage to be performed by the Gateway. In Step 5120 the Gateway checks to see whether the status is set to indicate that a response should be provided to the user. If so, execution proceeds to Step 5190, which ends the request handling routine and returns control to a calling routine, which then provides a response to the user. Otherwise execution proceeds to Step 5130. In Step 5130, the Gateway checks to see if the status is set to indicate that forward translation is required. Forward translation is necessary to translate an outgoing message into a format that can be understood by the host computer. If forward translation is indicated, execution proceeds to Step 5135. In Step 5135, the outgoing message is forwarded translated, as more fully disclosed below with respect to Figure 53. If no forward translation is indicated, for example, if an already-translated transaction is being retried, execution proceeds to Step 5140. In Step 5140, the Gateway checks to see if the next step is communication to the host. If so, the Gateway proceeds to Step 5145, and initiates host communication as will be more fully discussed below with respect to Figure 54. If not, execution proceeds to Step 5150. In Step 5150, the Gateway checks to see whether reverse translation is

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indicated. Reverse translation translates a response from a host into a format useable by the calling routine. If reverse translation is indicated, execution proceeds to Step 5155, and the reverse translation is performed, as will be more fully discussed below with respect to Figure 55. In any case, after either forward
5 translation in Step 5135, host communication in Step 5145, or reverse translation in Step 5155, control returns to Step 5120 for further processing. As will be more fully disclosed below, the forward translation, host communication, and reverse translation routines manipulate status indicators to prevent the occurrence of an infinite loop.

10

AnalyzeSetRequest

Figures 52A and 52B describe the AnalyzeSetRequest routine. This routine is by Step 5110 as illustrated in Figure 51. Execution begins in Step 5200. In Step 5205 the various fields in the SET record are obtained, as will be more fully
15 disclosed below with respect to Figures 56A and 56B. In Step 5210 the Gateway checks the retry count. A retry count is zero indicates that the request being analyzed is a new request, and control proceeds to Step 5212, indicating a new request. If the retry account is non-zero, this means that the request is a retry of a prior request, and control proceeds to Step 5214 where a retry is indicated.

20

Following either step 5212 or 5214, execution proceeds to Step 5215. In Step 5215 the Gateway checks to see whether the request represents a "stale request," as will be more fully described below with respect to Figure 57. In Step 5220, the Gateway tests the result of the stale check from Step 5215. If the request is stale it is
25 marked as stale in Step 5222. Otherwise the record is marked as not stale in Step 5224. Following either Step 5222 or Step 5224, control proceeds to Step 5230. In Step 5230 a message representing the SET request is inserted into the database for tracking purposes, and control proceeds to Step 5240.

30 In Step 5240 the Gateway checks to see if the request had been marked stale in Step 5222. If so, it proceeds to Step 5242, exiting with an error condition. In Step 5245, the Gateway attempts to retrieve from the database a message corresponding to the current SET request, as will be fully disclosed below with respect to Figure 59. Step 5260 checks to see whether the message was successfully retrieved from the
35 database. If the message was not found in the database, this indicates that the SET request represents a new message, and control proceeds to Step 5270. In Step 5270 a new message representing the SET request is added to the database, as is

more fully disclosed below with respect to Figure 60. Because this is a new request, it must be processed from the beginning, including forward translation. Therefore, after the new message is added in Step 5270, control proceeds to Step 5275. In step 5275, where a status flag is set indicating that the next step to be performed

5 for this message is for translation. If the message was found in Step 5260, this indicates that the request represents a request that is already in progress. Therefore, control proceeds to Step 5280 to update the database with current information representing the request status. The update process is described in further detail with respect to Figure 61, below. Following Step 5280, control

10 proceeds to Step 5282. In Step 5282 the Gateway checks to see the disposition in which the SET request was left as a result of partial processing. This is done, for example, by interrogating fields in the database record that indicate the steps that have already been performed for this request. In Step 5283, based upon this status information, the Gateway indicates the next stage of processing to be performed:

15 either forward translation, reverse translation, or communication with the host. After this status has been set, whether for a new request in Step 5275, or for an already-existing request in Step 5283, control proceeds to Step 5290, which exits the AnalyzeSetRequest routine, returning control to Step 5110 in Figure 51.

20 TranslateForward

Figure 53 depicts the execution of the TranslateForward routine, which is called by Step 5135 in Figure 51. Execution begins at Step 5310. In Step 5320, the Gateway forward-translates the request to prepare it for transmission to the host. Forward translation consists of packaging the fields in the request into a format that is

25 understandable by the legacy system at the financial institution. The exact format of the translated request will vary from institution to institution. However, in general, the format will consist of a fixed length record with predetermined fields, using a standard character set such as ASCII or EBCDIC. In Step 5330, the Gateway checks to see whether the translation was successfully performed. If not

30 control proceeds to Step 5340, which returns an error condition. If the translation was successful, control proceeds to Step 5350. In Step 5350, the Gateway sets a status flag to indicate that the next stage to be performed for this SET request is to proceed to host communication. This will be used in the next iteration of the Gw_ClearSetRequestHandler routine as depicted in Figure 51. After the status is set

35 in Step 5350, the translate forward routine returns control in Step 5360.

The TranslateForward routine as depicted in Figure 51 may be implemented using the following C++ code:

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```

    gwAction CGW_Engine::TranslateForward(CPCLCCRequest *pVehicle)
    {
        gwRC      rc;
5        gwDBRC   dbrc;

        rc = HM_TranslateForward(m_hostSpecificMessage, pVehicle);

        if (rc == GW_SUCCESS) {
10            return (GW_PROCEED_WITH_HOST_COMMS);
        }

        m_hostRequestDisposition = GW_HREQDI_FWD_XLAT_FAILED;
        BuildSetErrorResponse(pVehicle, ISO_RESP_FORMAT_ERR);

15        dbrc = Gwdb_UpdateHostMsgRequestDisp();
        if (dbrc != GWDB_SUCCESS) {
            GW_LogError( LOG_ERR,
20            "Gwdb_UpdateHostMsgRequestDisp() : %d", dbrc);
        }

        return (GW_PROCEED_TO_RESPOND);
    }

```

25 **DoHostCommunication**

Figure 54 depicts the step of host communication, as shown in Step 5145 in Figure 51. Execution begins in Step 5400. In Step 5405 the Gateway obtains from the request object the string representing the request text. In Step 5410 it obtains the sequence number for the request. In Step 5415 the Gateway determines the current time, in order to record the time at which the request is made. In Step 5420 the Gateway sends the request to the host and waits for a response from the host. When a response is received, execution continues in Step 5425. In Step 5425, the Gateway again checks the current time, thereby determining the time at which a response was received. In Step 5430, the Gateway checks to see whether the communication was successfully performed. If a communication was not successful, the Gateway records that an error occurred in Step 5432. If the communication was successful, the Gateway, in Step 5435, indicates that the request was successfully

sent and responded to. In Step 5437, the Gateway sets the response string based upon the response received in Step 5420. In Step 5439 the Gateway sets a status to indicate that reverse translation of the received response is required. Regardless of whether the communication was successful or unsuccessful, execution continues to Step 5450. In Step 5450, the database is updated with status information from the host communication. In Step 5490, control is returned to the calling routine.

TranslateReverse

Figure 55 depicts the operation of the TranslateReverse routine, as executed in Step 5155 in Figure 51. Execution begins at Step 5500. In Step 5510 the Gateway reverse-translates the response received from the legacy system host. Reverse translation consists of extracting data from the data records received from the legacy system, and placing them in objects so that they are useable by the Gateway. In Step 5520, the Gateway checks to verify that translation was successful. If translation was successful control proceeds to Step 5530, where a status flag is set indicating a successful translation. If translation was not successful, control proceeds to Step 5540, in which the Status Flag is set to indicate an unsuccessful translation. Regardless of whether translation was successful or unsuccessful, execution proceeds to Step 5550. In Step 5550, a status flag is set to indicate that the next stage for the request is to provide a response from the Gateway. This step is always executed, because, regardless of whether the translation or any other aspect of the transaction was successful, a response indicating either success or failure must be returned by the Gateway. Control then proceeds to Step 5590, in which the TranslateReverse routine returns control to the calling routine in Figure 51. It will be seen that the TranslateForward routine in Figure 53, the DoHostCommunication routine depicted in Figure 54, and the TranslateReverse routine depicted in Figure 55, each alter the status of the request. As a result as the loop depicted in Figure 51 executes a particular request will proceed through all three stages and finally to exit in Step 5190.

GetSetKeyFields

Figures 56A and 56B describe the GetSetKeyFields routine. This routine is called by Step 5205 as illustrated in Figure 52A. Execution begins in Step 5600. In Step 5610, the Gateway interrogates the request object to determine the request type. In Step 5620, the Gateway determines whether the request type is for authorization only. If the request type is not for authorization only, execution proceeds to Step

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5625. In Step 5625, the Gateway checks to see whether the request type is for a sale. If the request type is neither for authorization only nor for a sale, execution proceeds to Step 5630. In Step 5630, the Gateway indicates that the request type is not a supported request, and proceeds to Step 5635, where it returns to the caller.

5

If the request type is either for authorization only or for a sale, execution proceeds with Step 5640. In step 5640, the Gateway initializes a container object to represent the request. In Step 5650, the Gateway extracts the [transaction identifier?] (XID) for the transaction. In Step 5652, the Gateway extracts the merchant identifier (MID) for the transaction. In Step 5654, the Gateway extracts the [what is the RRPID?] (RRPID) and the terminal identifier (TID) for the request. In Step 5656, the Gateway extracts the retry count associated with the current request. In Step 5660, a message data area is initialized with the extracted contents. The message area can then be used for further processing by the called routine. In Step 5690, the GetSetKeyFields routine returns control to the caller.

15

Gwdb_IsSetMsgStale

Figure 57 depicts the Gwdb_IsSetMsgStale routine. This routine is called by Step 5215 as illustrated in Figure 52A. Execution begins in Step 5700. In Step 5710, the Gateway checks to see whether this is the first time the Gwdb_IsSetMsgStale has been called for this request. If this is the first time, Steps 5715 through 5730 are performed; otherwise those steps are skipped. In Step 5715, a field representing the message life is initialized to a predetermined duration. The message life is a field that will be used to determine how long the message representing the transaction will remain valid. The use of the message life field prevents a transaction that is effectively lost due to extensive processing delays from being processed. In Step 5720, the Gateway checks to see if the value of the message life is equal to zero. If the message life is equal to zero, a default value, i.e., 300 seconds or 5 minutes, is assigned to the message life in Step 5725. In Step 5730, an indicator for this request is set to indicate that first time processing has already been performed for this request. This flag is the same flag interrogated in Step 5710, and is used to prevent successive reinitialization of the message life field.

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In Step 5740, the Gateway checks to see whether the merchant's time stamp, plus the value of the message life, is less than the time of the request. If so, then the request is considered stale, and is marked stale in Step 5750. If not, the request is not stale, and is marked not stale

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in Step 5755. Following either of Step 5750 or 5755, the Gwdb_IsSetMsgStale exits in Step 5790.

Gwdb_InsertSetMsg

5 Figure 58 depicts the Gwdb_InsertSetMsg routine. This routine is called from Step 5230 as illustrated in Figure 52A. Execution begins in 5800. In Step 5810, the routine invokes a database insert function by, for example, executing an SQL INSERT command. In Step 5820, the database return code is obtained in order to be used as a return code from the Gwdb_InsertSetMsg routine. In Step 5830, a
10 database commit function is performed, thereby instructing the database engine to commit the database changes to a permanent recording, i.e., by writing the information to the file, and/or by journalizing the change made by INSERT function. In Step 5890, the routine returns control to the calling program.

Gwdb_GetHostMsg

15 Figure 59 depicts the Gwdb_GetHostMsg routine. This routine is called by Step 5245 as shown in Figure 52B. Execution begins in Step 5900. In Step 5910, the routine invokes a database select function by, for example, executing an SQL SELECT command. In Step 5920, the database return code is obtained in order to be used as a return code from the Gwdb_InsertSetMsg routine. In Step 5930, the
20 Gateway checks to see whether the database retrieve operation was successfully performed. If so, execution proceeds to Step 5935. In Step 5935, the Gateway sets a number of status variables from the values retrieved from the database records. This includes the time the request was made, the time a response was received, the
25 contents of the request string, the contents of the response string, and a sequence number for this request. In Step 5940, a commit operation is performed. [What is the point of a commit operation following a retrieval, as opposed to an insert or an update?] In Step 5900, control returns to the calling program.

Gwdb_InsertHostMsg

30 Figure 60 depicts the Gwdb_InsertHostMsg routine. This routine is called by Step 5270 as illustrated in Figure 52B. Execution begins in Step 6000. In Step 6010, the routine invokes a database insert function by, for example, executing an SQL INSERT command. In Step 6020, the database return code is obtained in order to be used as a return code from the Gwdb_InsertSetMsg routine. In Step 6040, a
35 commit operation is performed. In Step 6090, the routine returns control to the calling program.

Gwdb_UpdateSetMsgResponseInfo

- Figure **61** depicts a flow diagram for the Gwdb_UpdateSetMsgResponseInfo routine. Execution begins at Step **6100**. In Step **6110**, the routine invokes a database update function by, for example, executing an SQL UPDATE command. In Step **6120**, the database return code is obtained in order to be used as a return code from the Gwdb_UpdateSetMsgResponseInfo routine. In Step **6190**, the routine returns control to the calling program.
- Figure **62** is the main administration display for the Gateway in accordance with a preferred embodiment. A set of menu selections are presented at **6200** which will be described in more detail for each display. Figure **63** is a configuration panel in accordance with a preferred embodiment. The configuration panel provides access to management information for configuring a gateway management information database. The Merchant Identifier (Mid) **6310** is a thirty character, alphanumeric field that uniquely defines a merchant. The Merchant Name **6320** is a fifty character, alphanumeric field, the Edit **6330** and Delete field **6340** are hyperlinks to detailed panels for modifying information in the management information database. Figure **64** is a host communication display for facilitating communication between the gateway and the acquirer payment host. The IP Address Field **6410** contains the Internet Protocol address for communicating via TCP/IP to the Internet. The TCP logical port field **6430** uniquely identifies the port for accessing the Internet, and the SAVE field **6430** invokes storing of the host communication information in the database. Figure **65** is a Services display in accordance with a preferred embodiment. This display initiates portions of the Gateway such as the host multiplexer **2130** of Figure **21**. Figure **66** is a graphical representation of the gateway transaction database in accordance with a preferred embodiment. Each of the fields represents a portion of the internet database schema in accordance with a preferred embodiment.

CLAIMS

What is claimed is:

- 1 1. A method for communicating between a gateway, and an existing host
2 payment application, comprising the steps of:
3 (a) establishing a communication link between the gateway and the host payment
4 application;
5 (c) receiving a host message in response to a gateway transaction;
6 (d) parsing one or more transaction response values from the host message;
7 (e) mapping the one or more transaction response values to a canonical
8 response code; and
9 (f) storing the canonical response code in a transaction log.
- 1 2. The method of claim 1, including the steps of;
2 (g) establishing a communication link between the gateway and the server;
3 (h) transmitting the canonical response code from the gateway to the server;
4 (i) indexing a database with the canonical response code to obtain a message; and
5 (j) displaying the message to an end user.
- 1 3. The method of claim 1, wherein the messages include payment administration
2 information.
- 1 4. The method of claim 1, wherein the messages include payment exception
2 information.
- 1 5. The method of claim 1, wherein the messages include payment result
2 information.
- 1 6. The method of claim 1, including the step of modifying the database without
2 impacting the system.
- 1 7. The method of claim 1, wherein the canonical response code provides support
2 for secure electronic protocol.

- 1 8. A method for communicating between a server, a gateway and a host as
2 recited in claim 1, including the steps of:
- 3 (a) establishing a first communication link between the server and the gateway;
4 (b) logging transaction information in a first transaction database at the server;
5 (c) transmitting a transaction from the server to the gateway over the first
6 communication link;
7 (d) establishing a second communication link between the gateway and the host;
8 (e) logging transaction information in a second transaction database at the
9 gateway;
10 (f) transmitting a transaction from the gateway to the host over the second
11 communication link;
12 (g) receiving a transaction response from the host;
13 (h) parsing the transaction response to obtain an index to the corresponding
14 logged transaction information in the second transaction database in the
15 gateway;
16 (i) updating the transaction response in the second transaction database in the
17 gateway with information from the response transaction from the host;
18 (j) transmitting the response transaction to the server over the first
19 communication link;
20 (k) parsing the transaction response to obtain an index to the corresponding
21 logged transaction information in the first transaction database in the server;
22 (l) updating the transaction response in the second transaction database in the
23 server with information from the response transaction from the host; and
24 (m) displaying payment information corresponding to the transaction on a
25 display.
- 1 9. The method of claim 8, including the step of the server detecting a transaction
2 response failure and resending the corresponding transaction from first
3 transaction database with appropriate modifications.
- 1 10. The method of claim 8, including the step of detecting a valid retry transaction,
2 retrieving information from the second transaction database at the gateway
3 and updating the transaction with previously received host transaction results
4 from the retrieved information before transmitting the transaction to the
5 server.

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1 11. The method of claim 8, including the step of detecting an invalid transaction by
2 parsing a transaction to obtain a key and comparing the key to keys in the
3 second transaction database at the gateway, determining that a key from the
4 transaction is identical to a key in the second transaction database and
5 rejecting the transaction.

1 12. The method of claim 8, including the step of detecting a stale transaction by
2 comparing a time stamp field in the transaction to a current time and rejecting
3 the transaction if the differential exceeds a predefined value.

1 13. The method of claim 12, including the step of modifying the predefined value
2 dynamically.

1 14. The method of claim 8, including the step of providing support for a secure
2 electronic protocol.

1 15. An apparatus for communicating between a gateway, and an existing host
2 payment application, comprising:

3 (a) program means for establishing a communication link between the gateway
4 and the host payment application;

5 (c) program means for receiving a host message in response to a gateway
6 transaction;

7 (d) program means for parsing one or more transaction response values from the
8 host message;

9 (e) program means for mapping the one or more transaction response values to
10 a canonical response code; and

11 (f) program means for storing the canonical response code in a transaction log.

1 16. The apparatus of claim 15, including:

2 (g) program means for establishing a communication link between the gateway
3 and the server;

4 (h) program means for transmitting the canonical response code from the gateway
5 to the server;

6 (i) program means for indexing a database with the canonical response code to
7 obtain a message; and

8 (j) program means for displaying the message to an end user.

- 1 17. The apparatus of claim 15, wherein the messages include payment
2 administration information.
- 1 18. The apparatus of claim 15, wherein the messages include payment exception
2 information.
- 1 19. The apparatus of claim 15, wherein the messages include payment result
2 information.
- 1 20. The apparatus of claim 15, including program means for modifying the
2 database without impacting the system.
- 1 21. The apparatus of claim 15, wherein the canonical response code provides
2 support for secure electronic protocol.

- 1 22. The apparatus for communicating between a server, a gateway and a host as
2 recited in claim 15, further comprising:
- 3 (a) means for establishing a first communication link between the server and the
4 gateway;
- 5 (b) means for logging transaction information in a first transaction database at
6 the server;
- 7 (c) means for transmitting a transaction from the server to the gateway over the
8 first communication link;
- 9 (d) means for establishing a second communication link between the gateway and
10 the host;
- 11 (e) means for logging transaction information in a second transaction database
12 at the gateway;
- 13 (f) means for transmitting a transaction from the gateway to the host over the
14 second communication link;
- 15 (g) means for receiving a transaction response from the host;
- 16 (h) means for parsing the transaction response to obtain an index to the
17 corresponding logged transaction information in the second transaction
18 database in the gateway;
- 19 (i) means for updating the transaction response in the second transaction
20 database in the gateway with information from the response transaction from
21 the host;
- 22 (j) means for transmitting the response transaction to the server over the first
23 communication link;
- 24 (k) means for parsing the transaction response to obtain an index to the
25 corresponding logged transaction information in the first transaction
26 database in the server;
- 27 (l) means for updating the transaction response in the second transaction
28 database in the server with information from the response transaction from
29 the host; and
- 30 (m) means for displaying payment information corresponding to the transaction
31 on a display.

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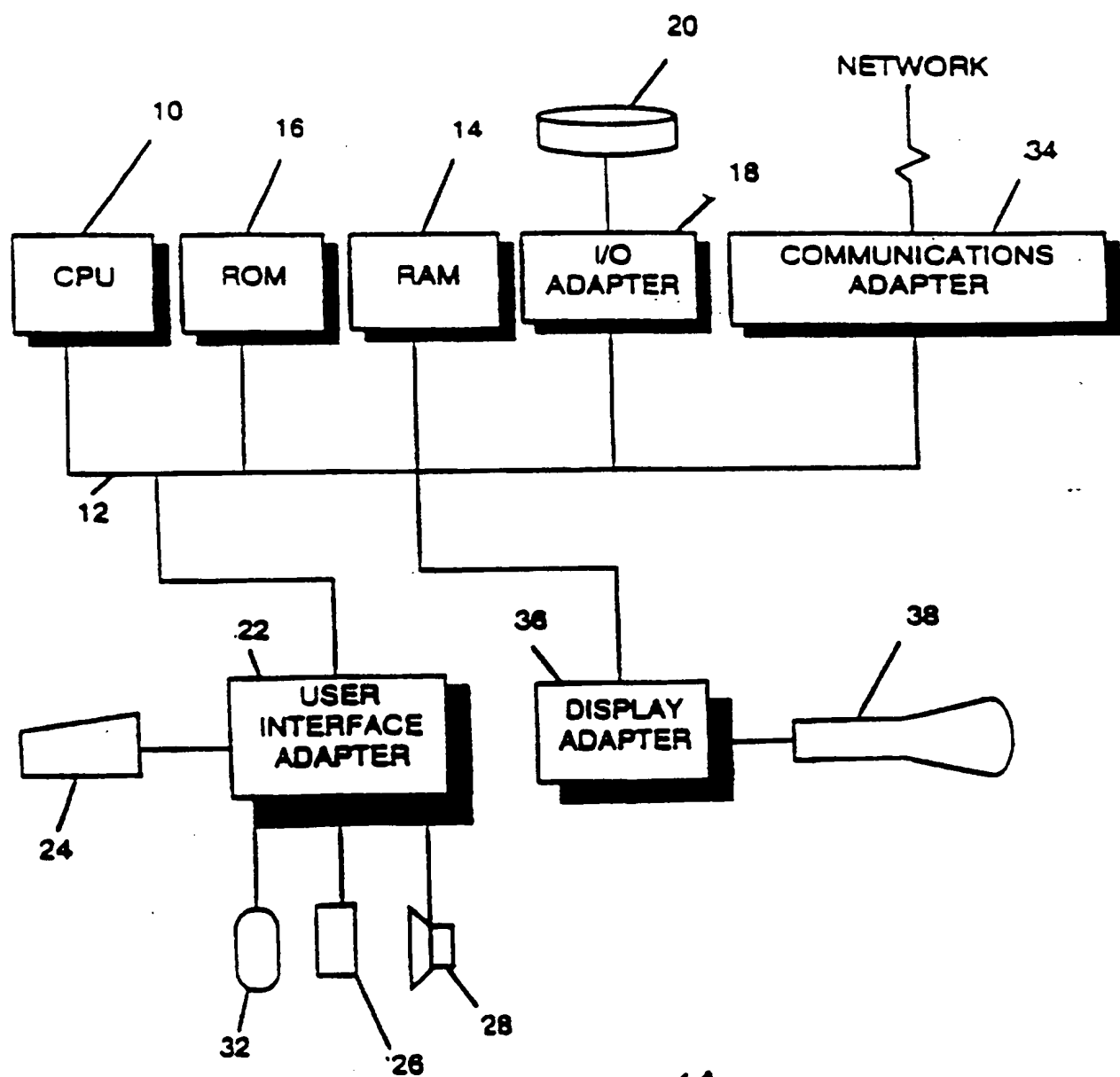


FIG. 1A

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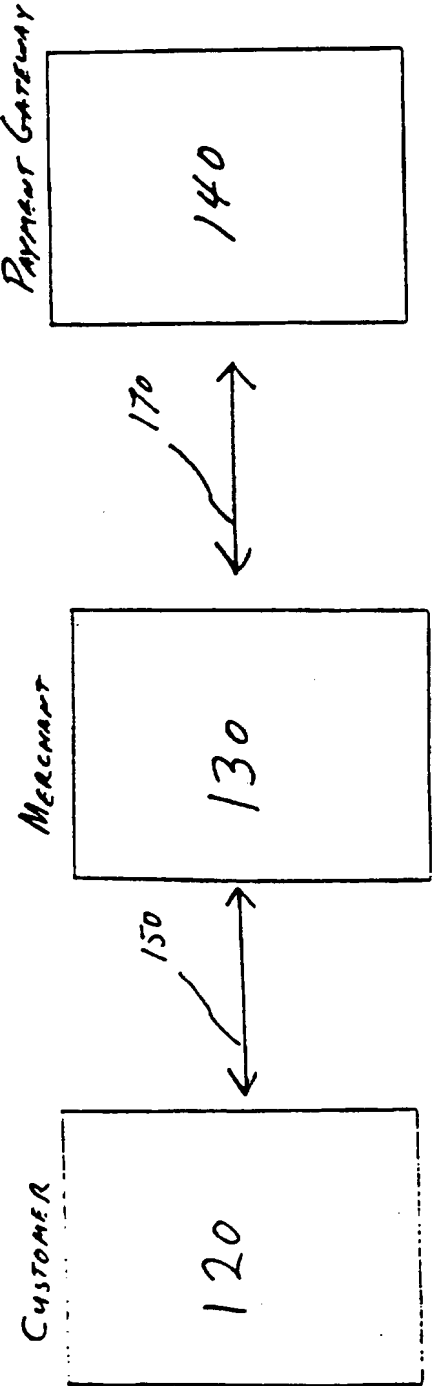


FIG 1B

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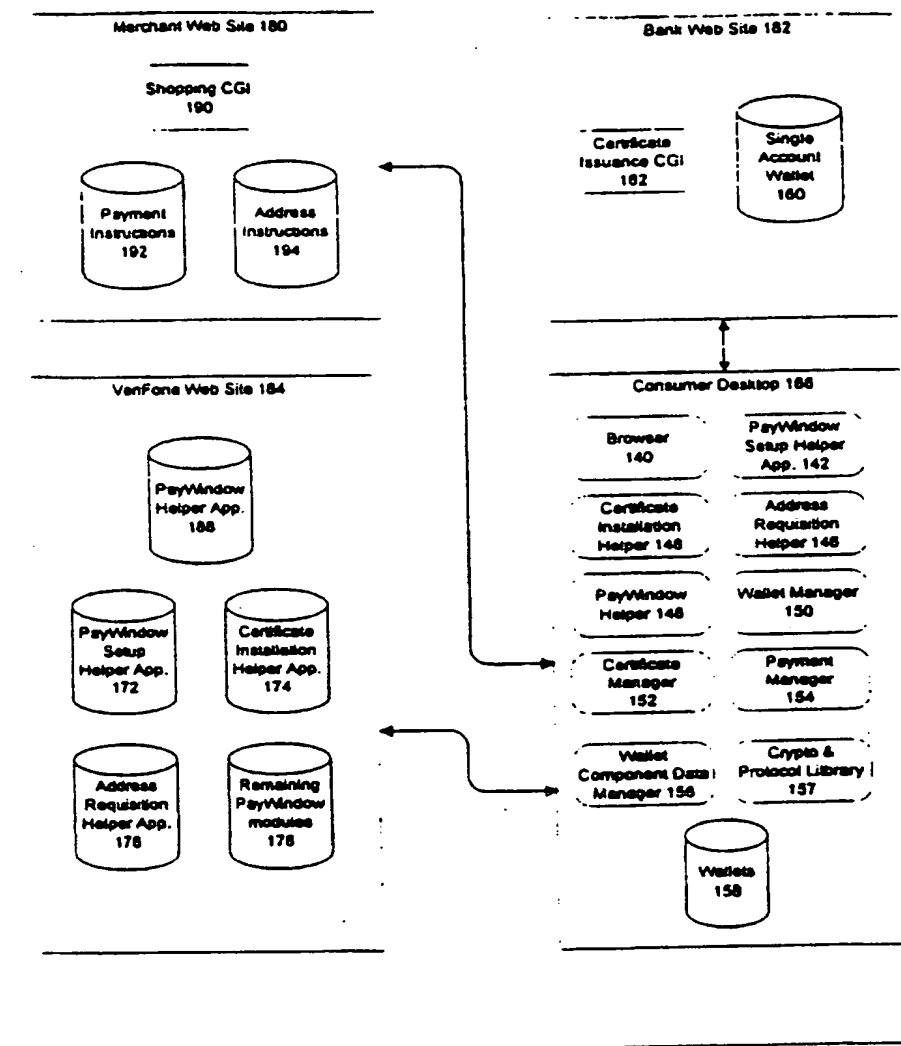


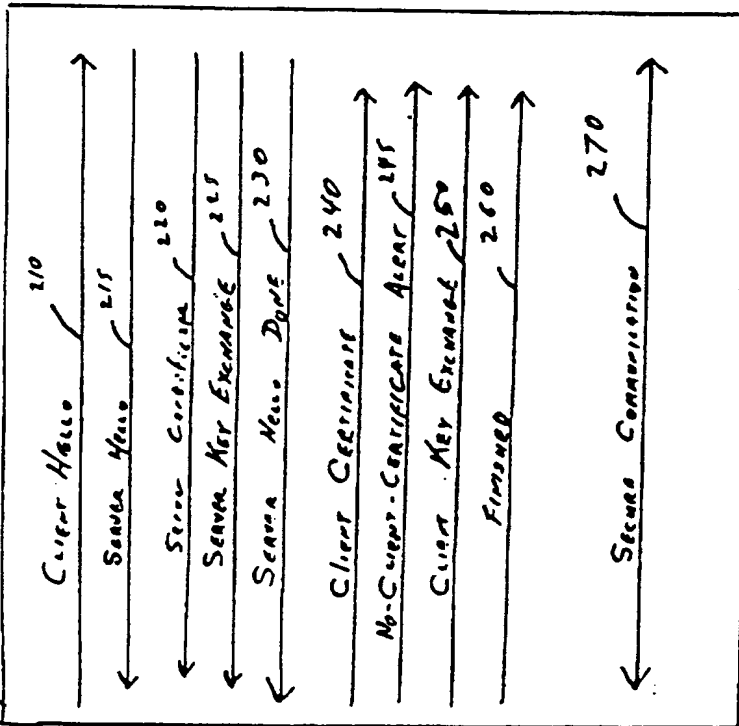
FIGURE 1C

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150

Customer

120



Message

130

Fig 2

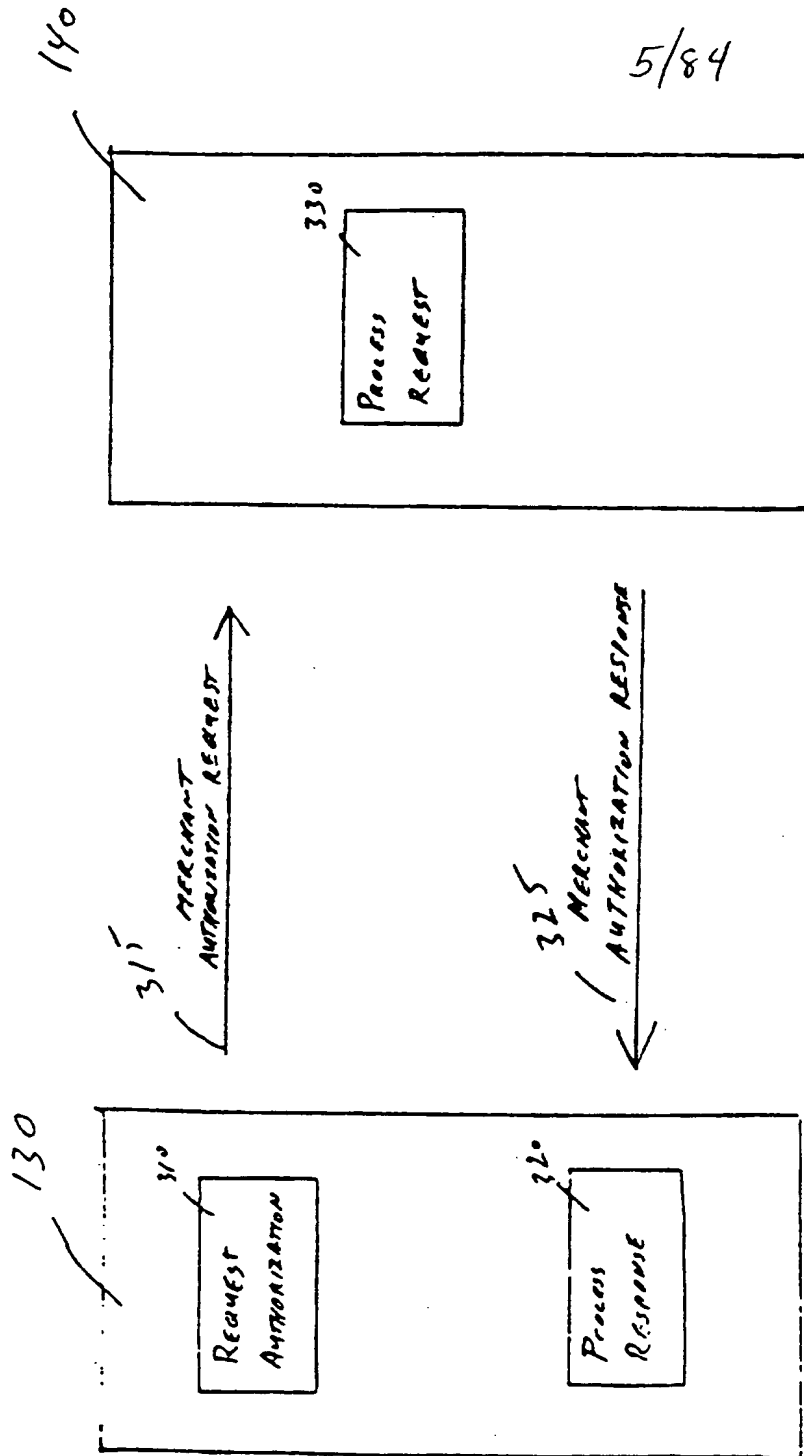
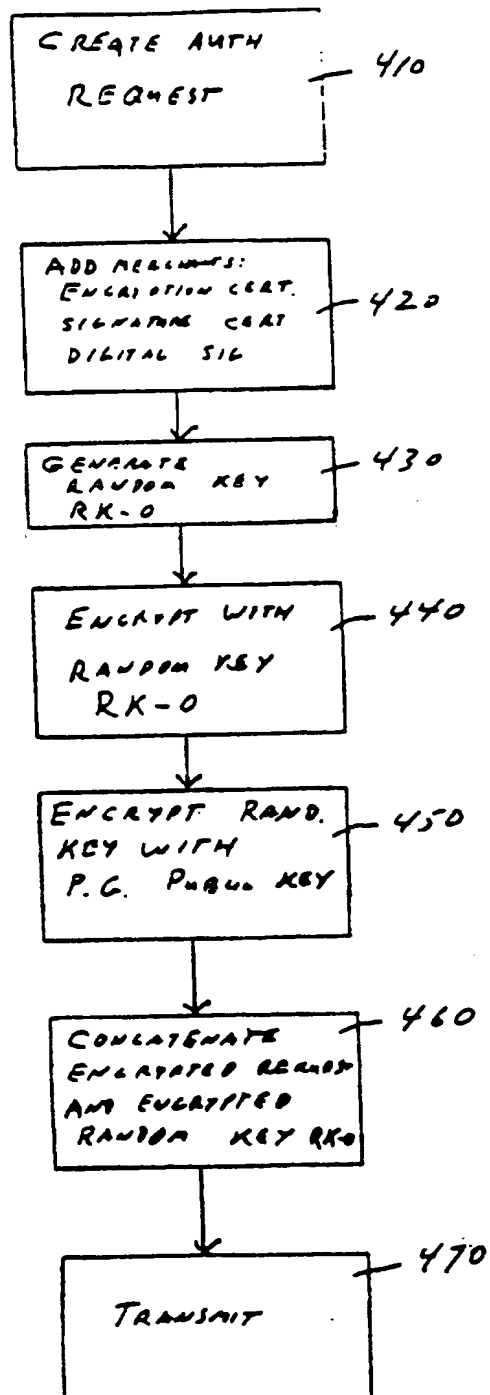


FIG 3

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FIG 4



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FIG 5A

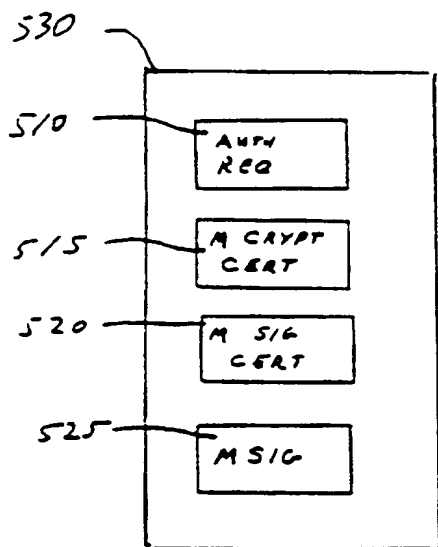


FIG 5B



FIG 5C

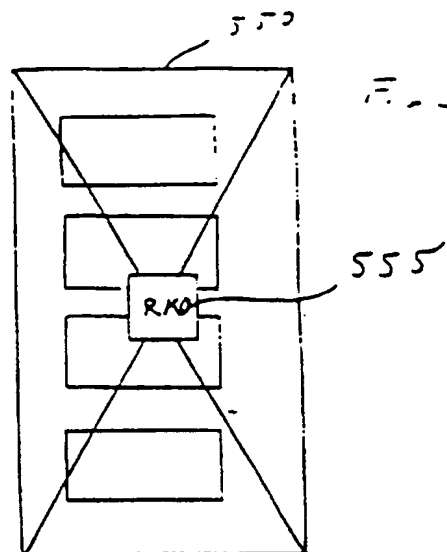


FIG 5D

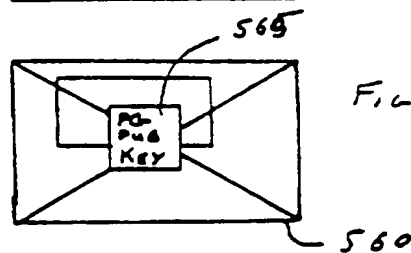


FIG 5E

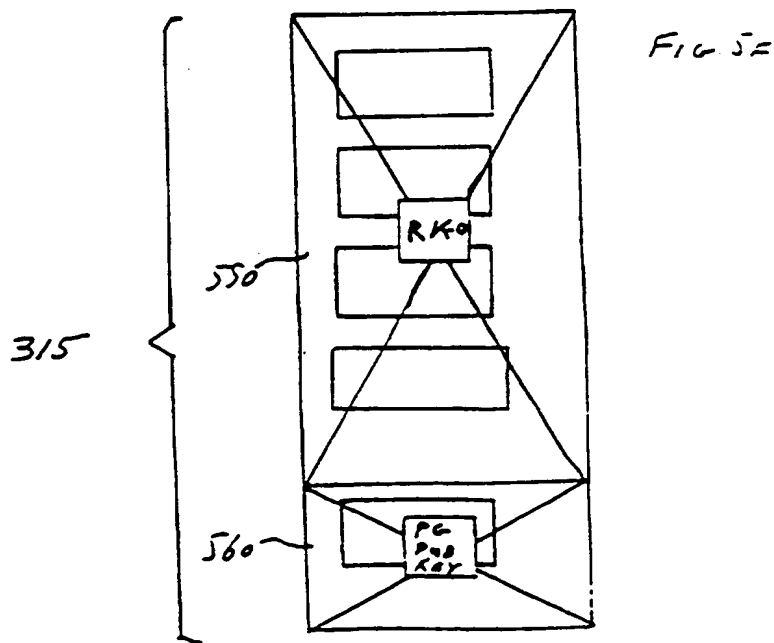


FIG 5F

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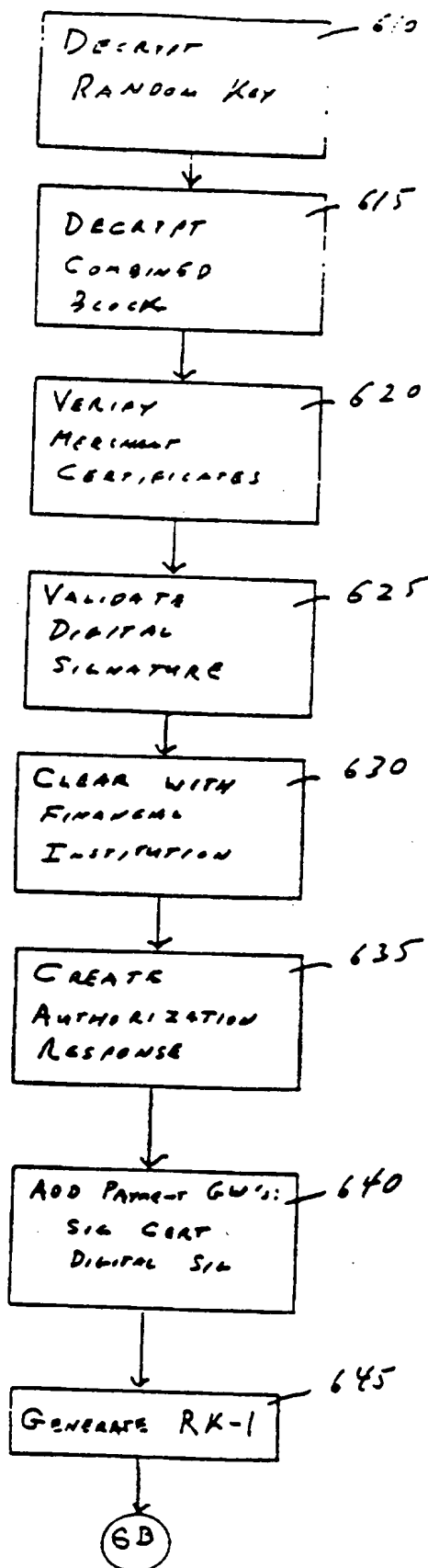


FIG. 5A

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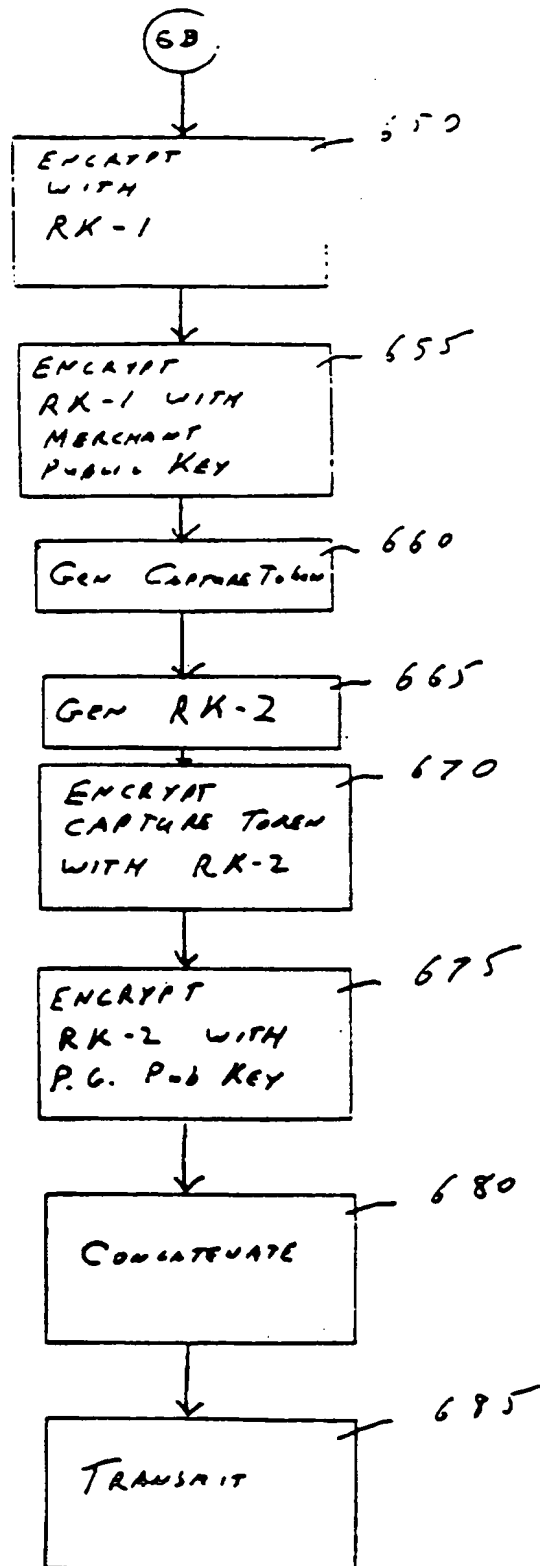


FIG. 6B

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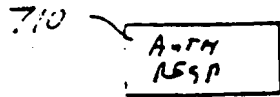


Fig 7A



Fig 7E

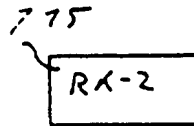


Fig 7G

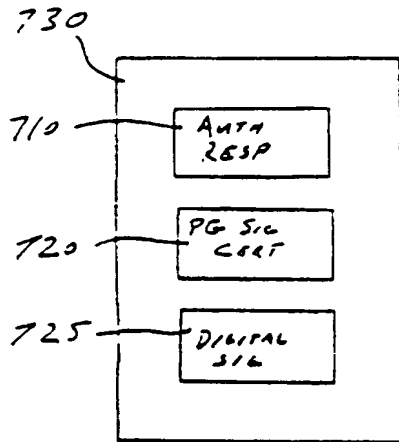


Fig 7B

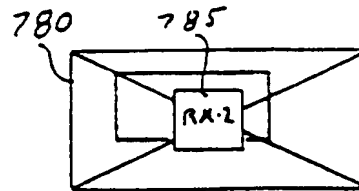


Fig 7H

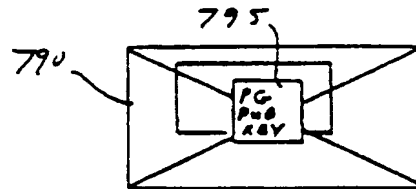


Fig 7I



Fig 7C

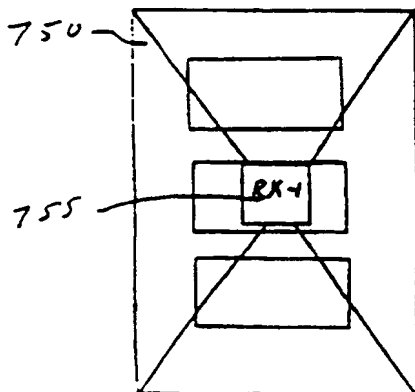


Fig 7D

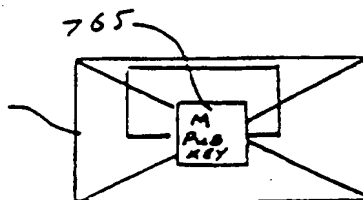


Fig 7E

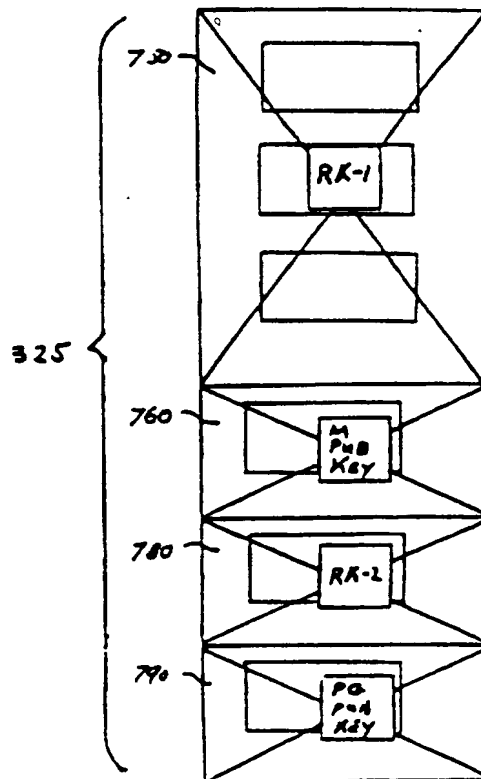


Fig 7J

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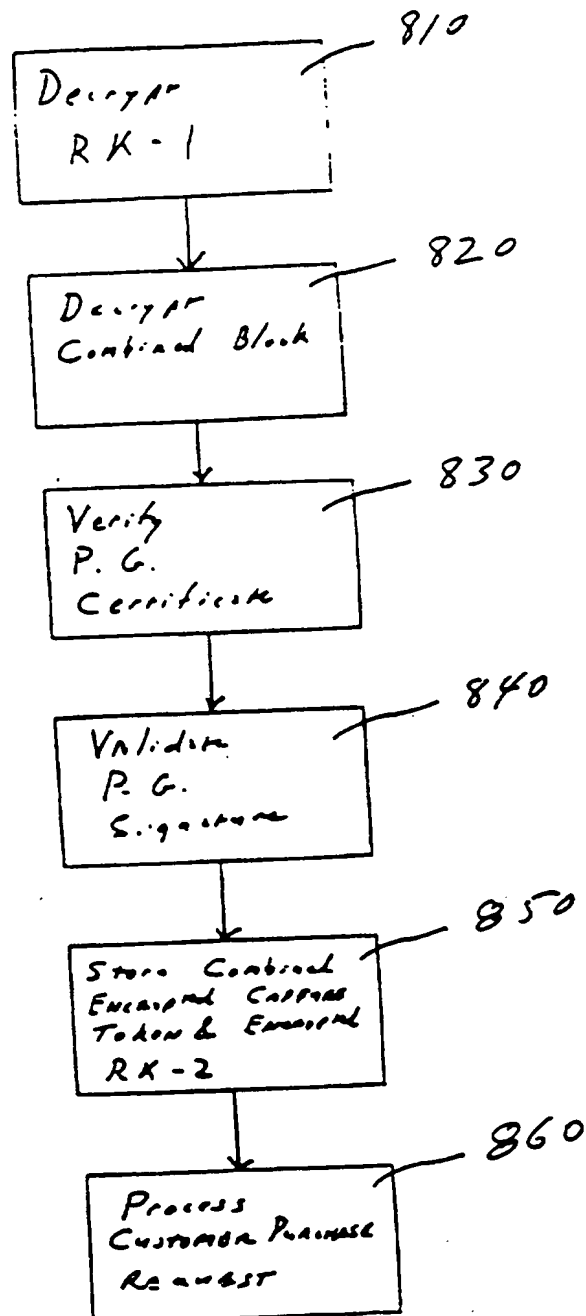


FIG. 8

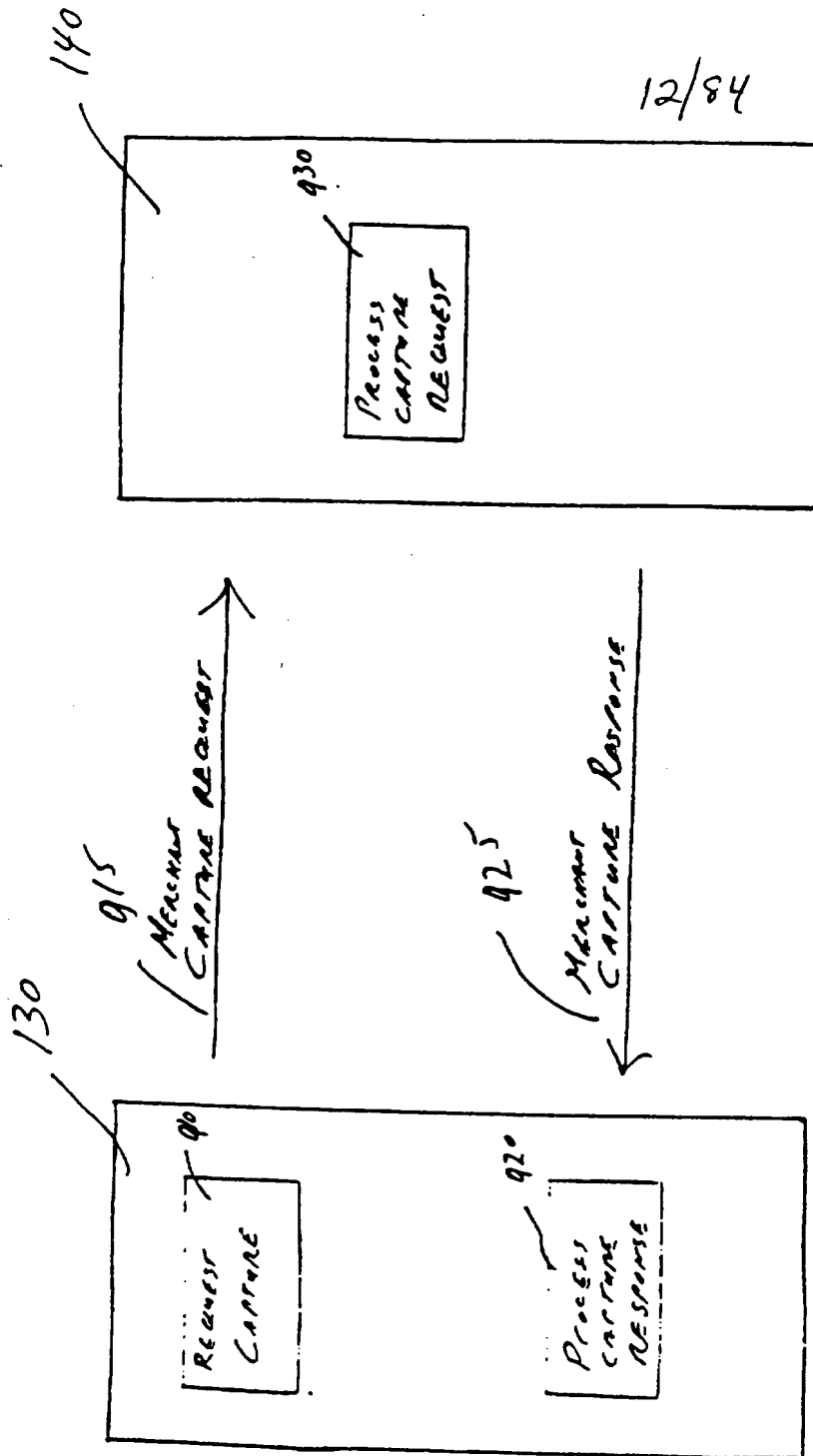


FIG 9

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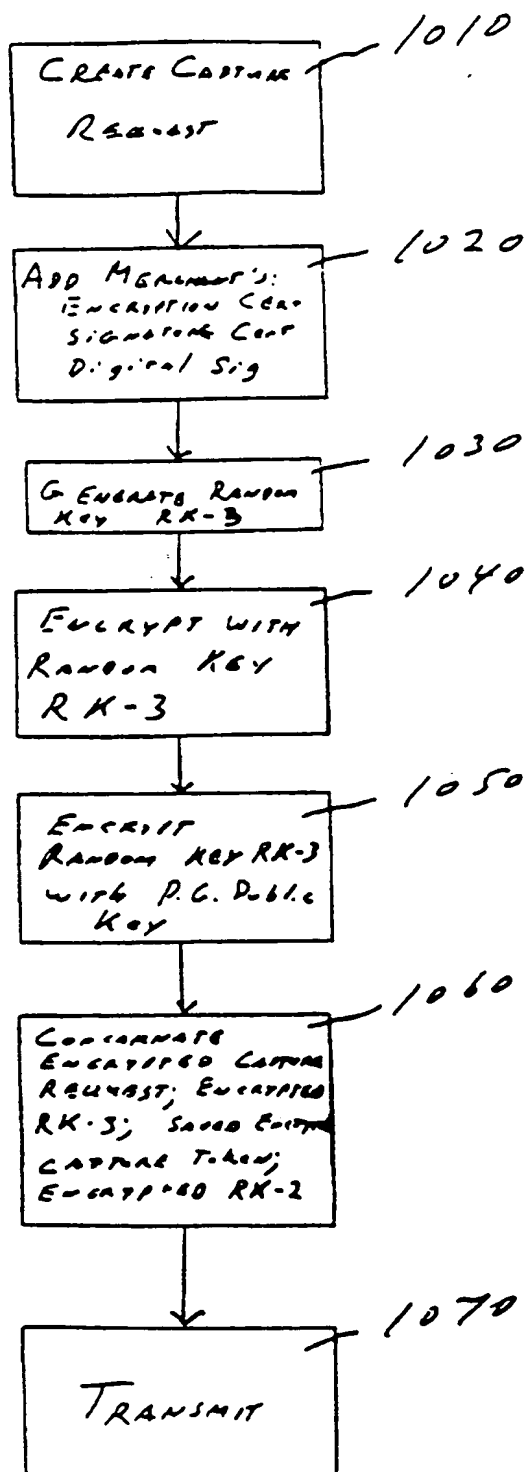


FIG 10



Fig. 11A

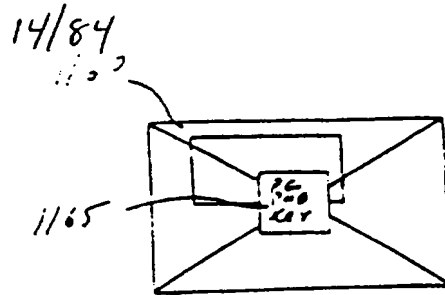


Fig. 11B

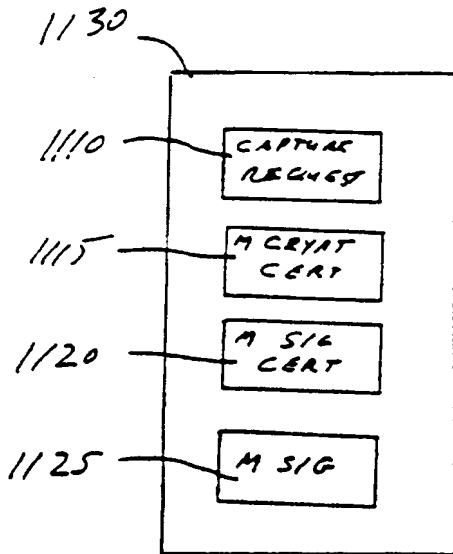


Fig. 11C



Fig. 11D

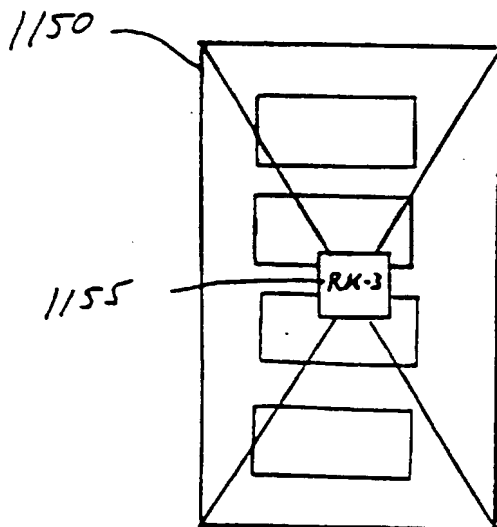


Fig. 11E

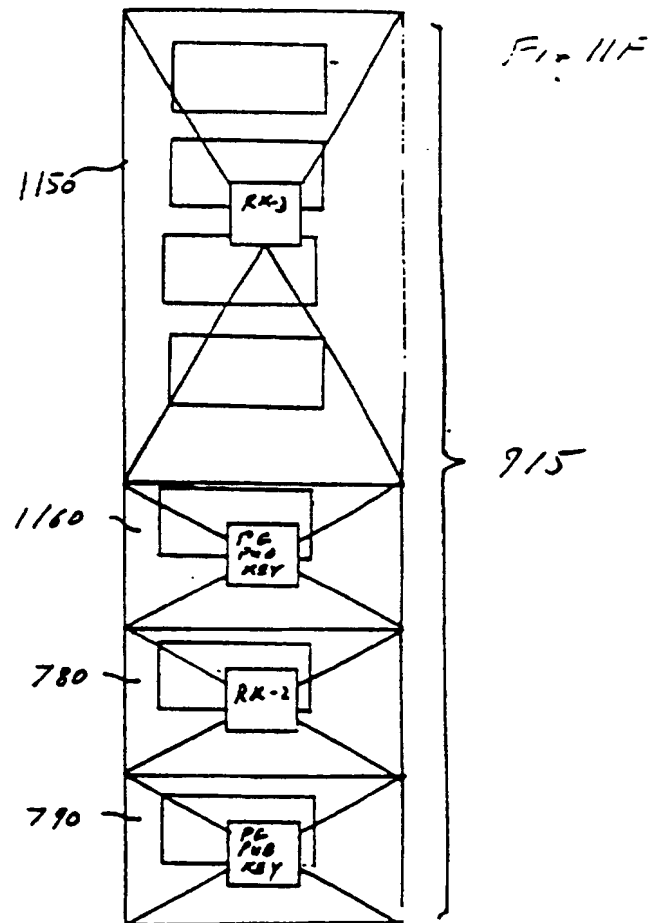


Fig. 11F

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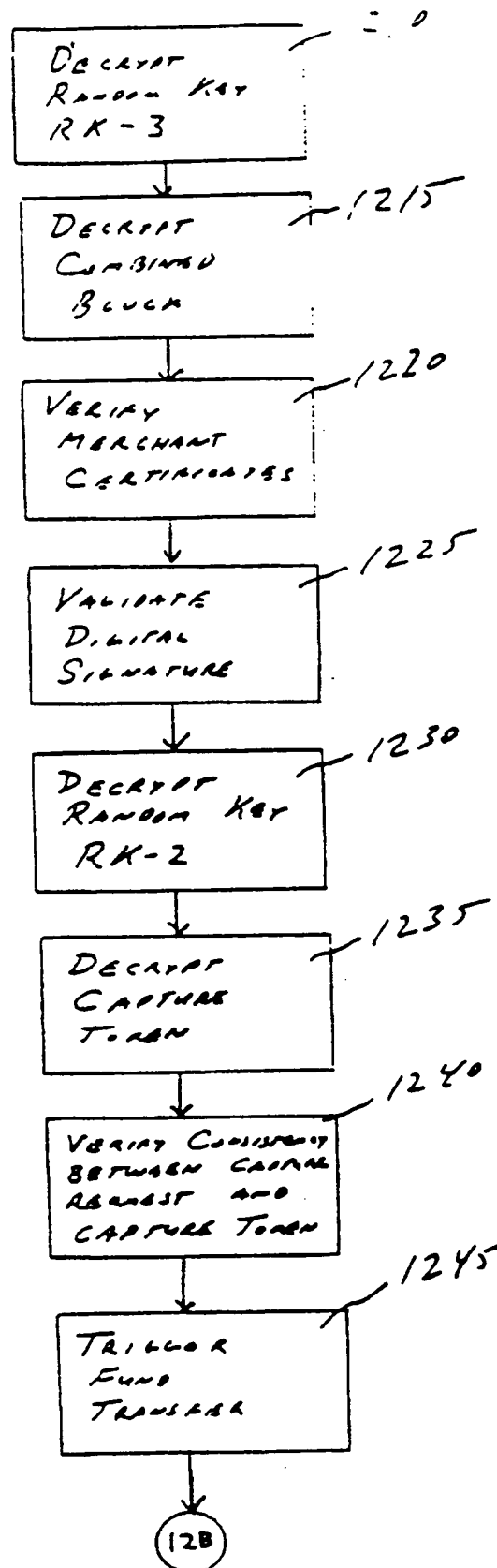


FIG. 12A

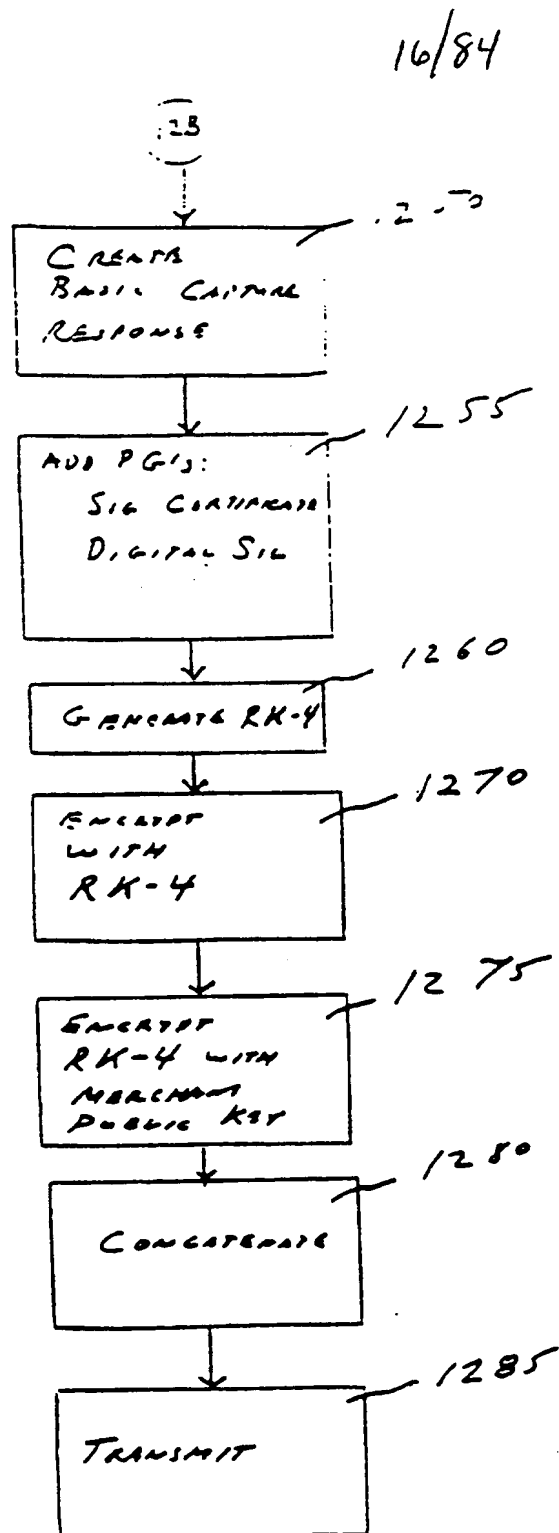


FIG. 12B

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Fig. 13A

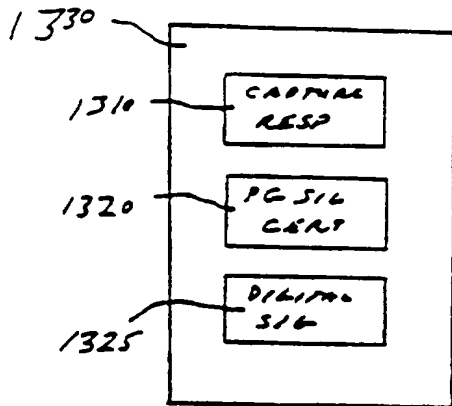


Fig. 13B

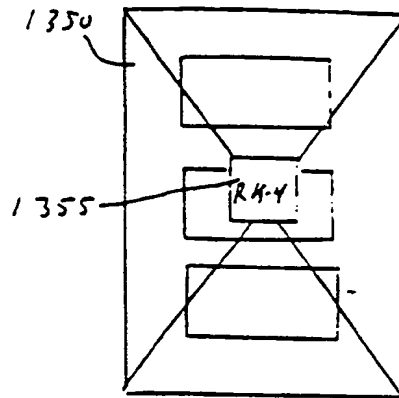


Fig. 13C

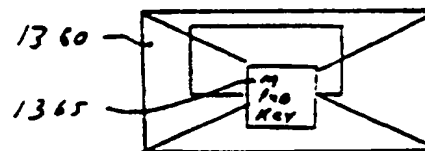


Fig. 13D



Fig. 13E

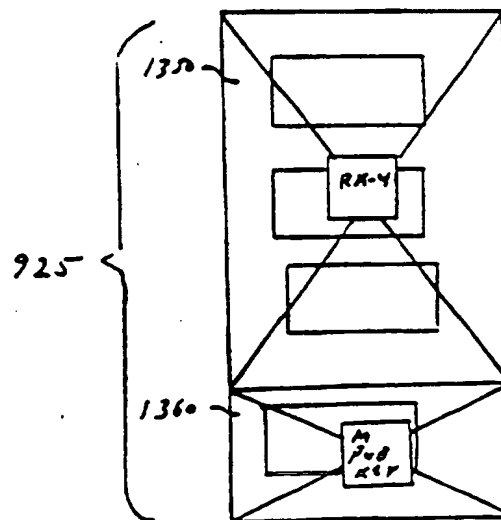


Fig. 13F

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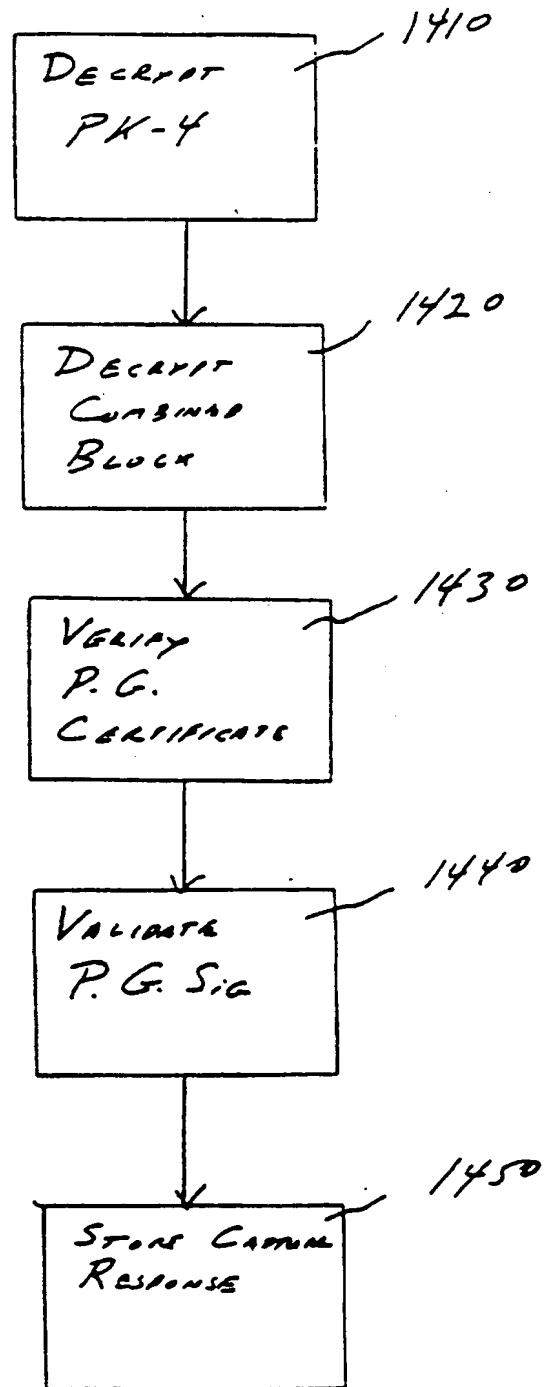


FIG. 14

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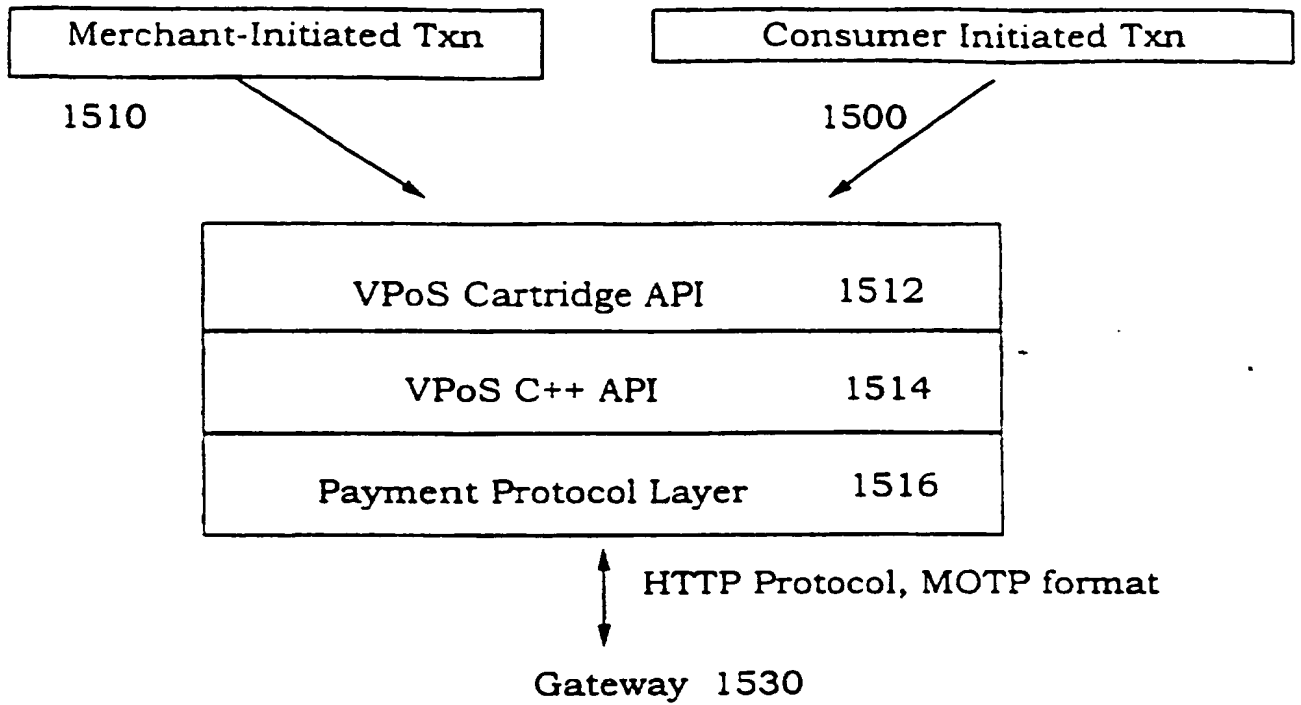


FIGURE 15A

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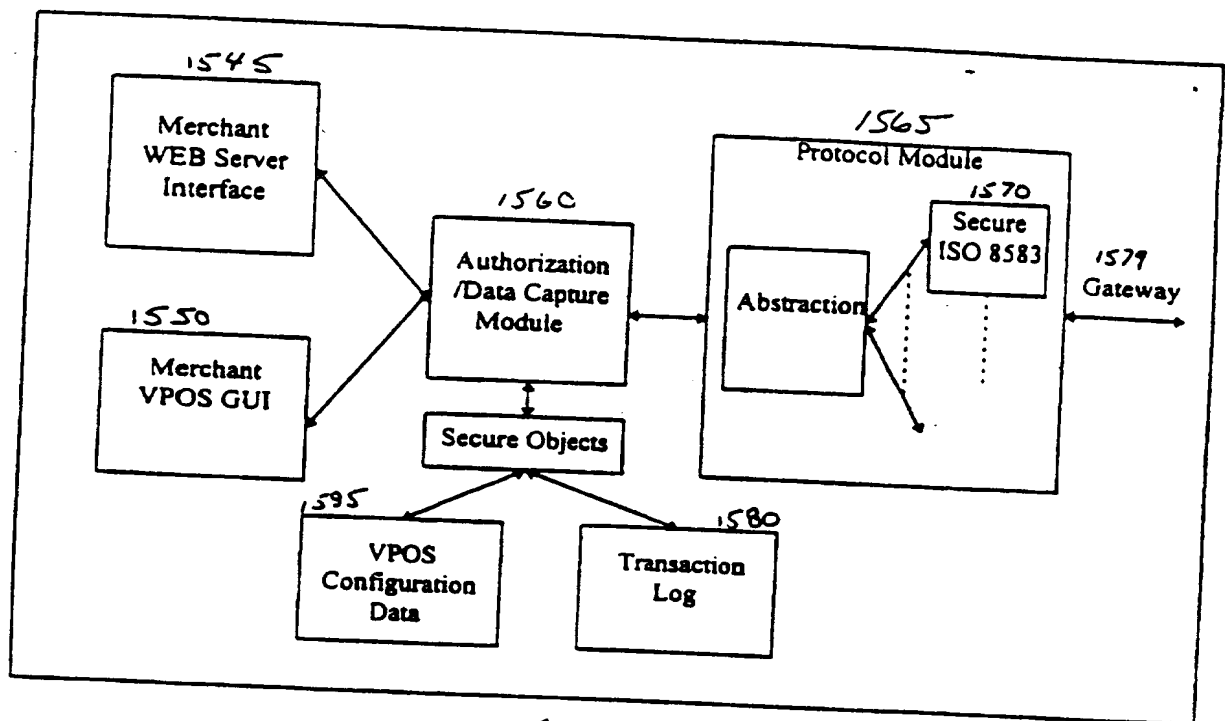


Figure 15B

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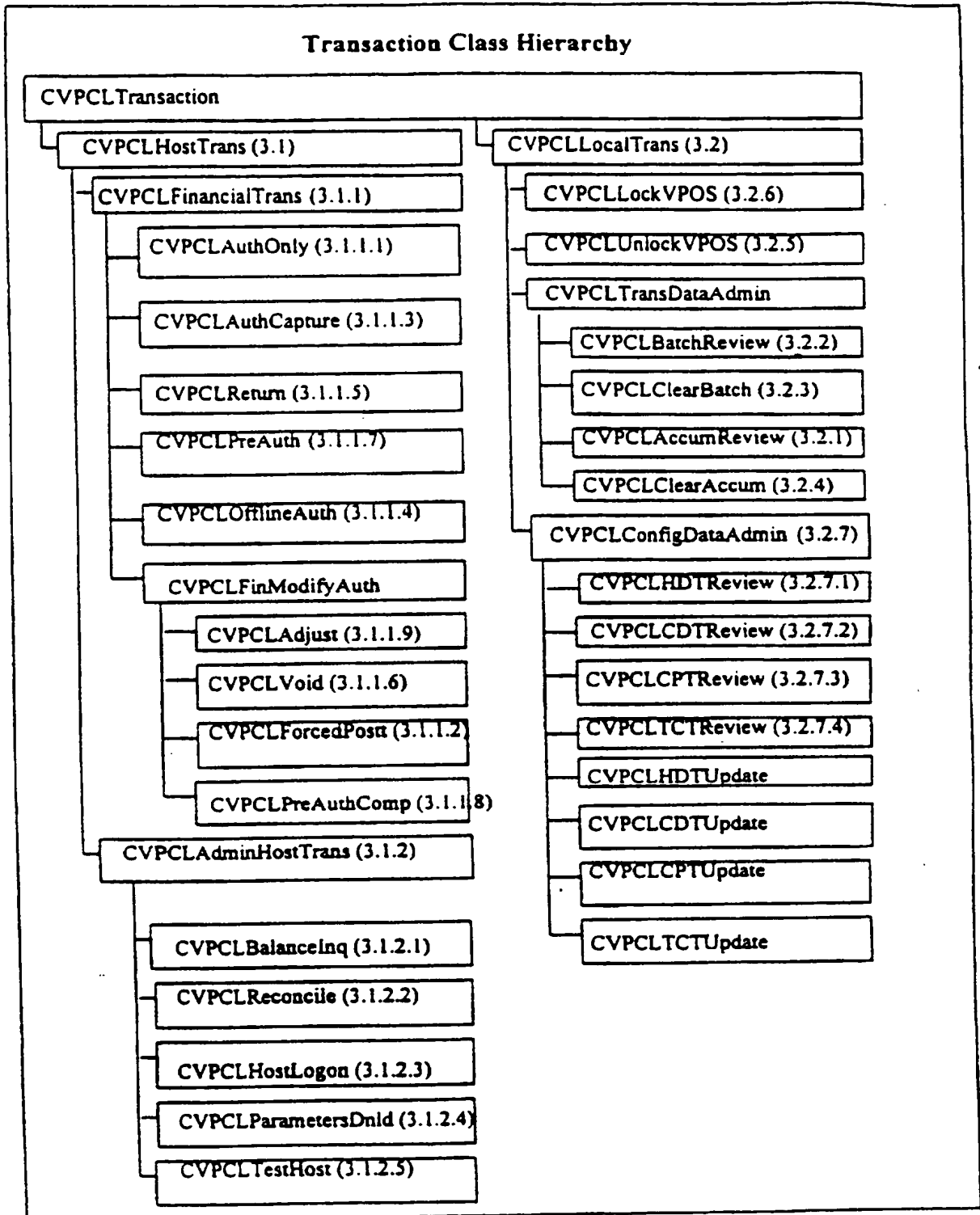


Figure 16

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1740

1730

1720

1710

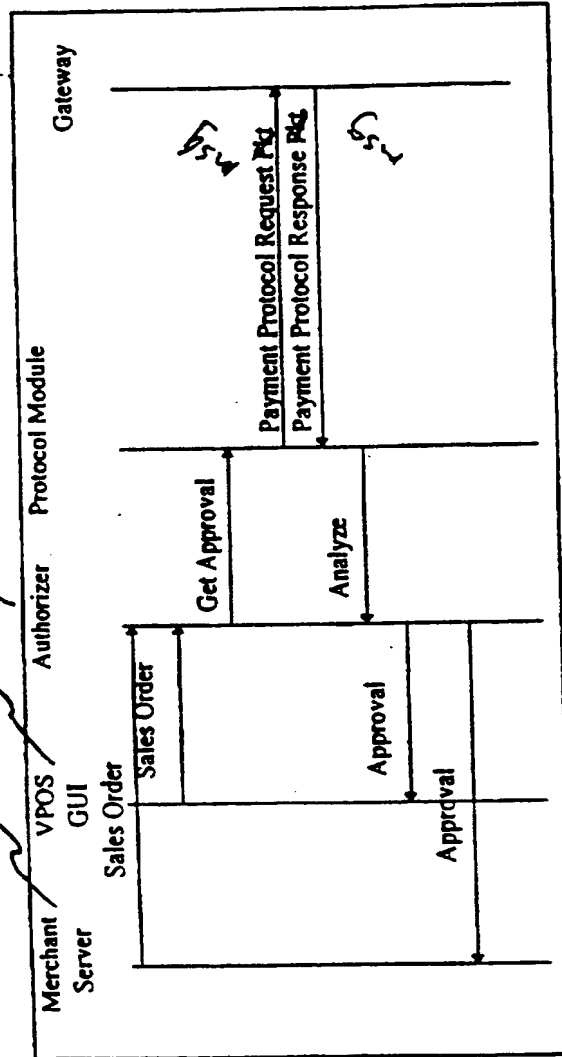


FIGURE 17

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Architecture:

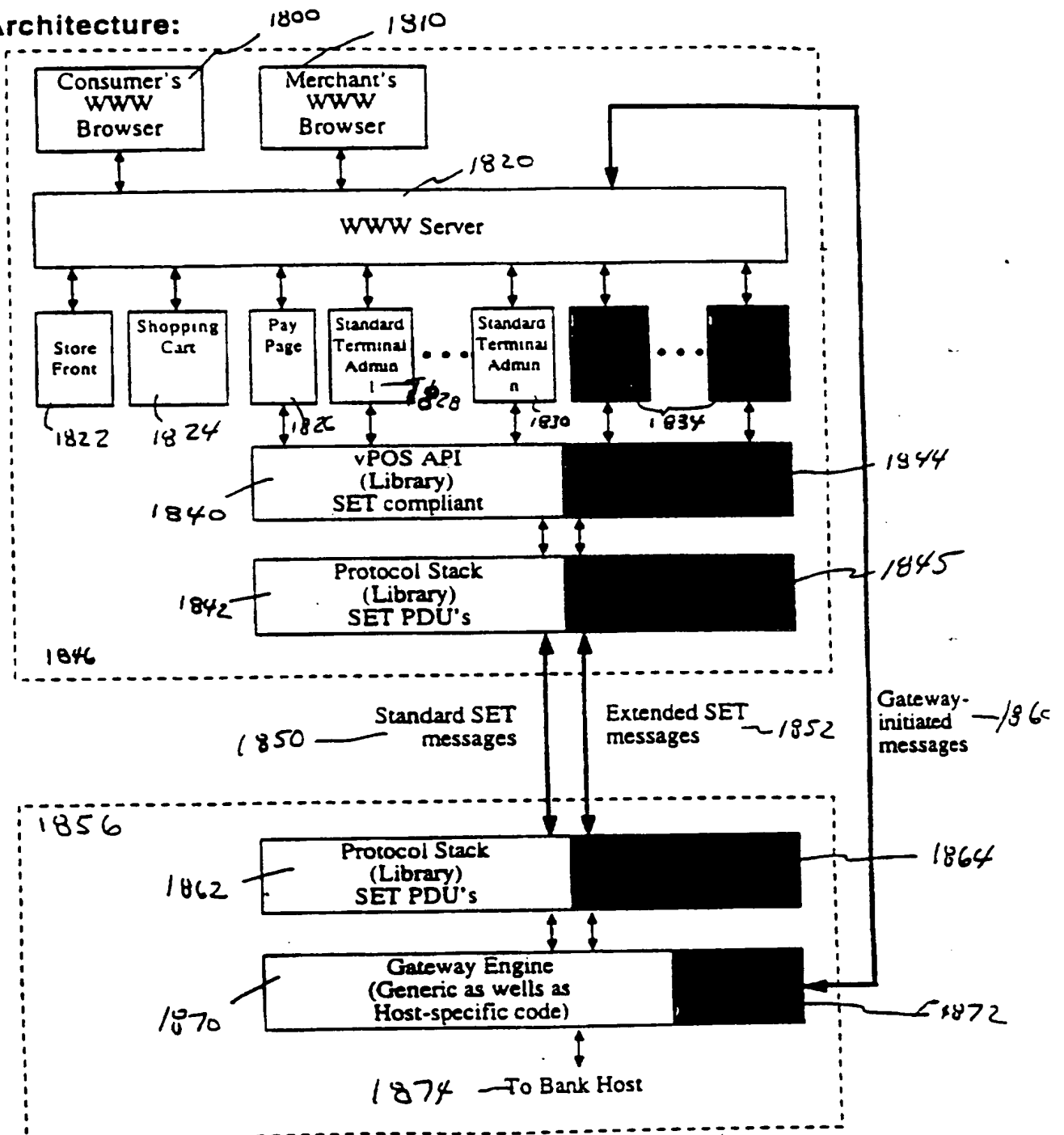


FIGURE 18A

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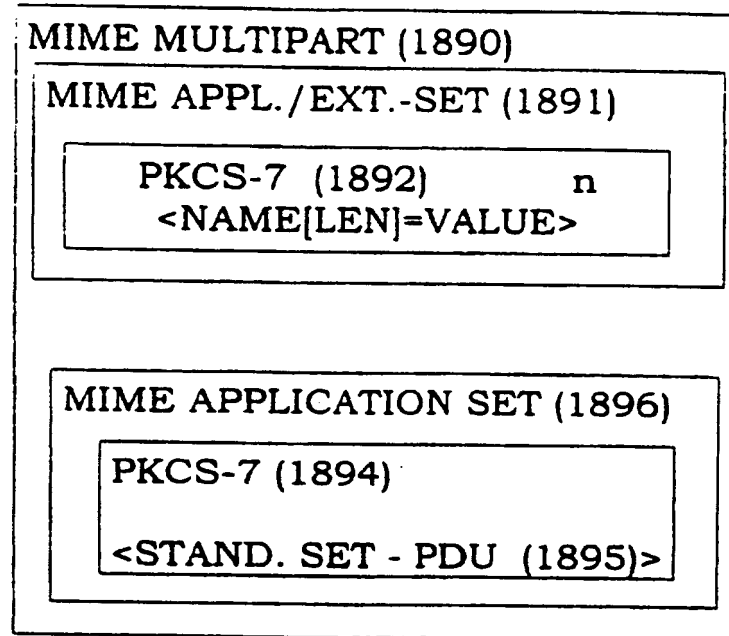


FIGURE 18B

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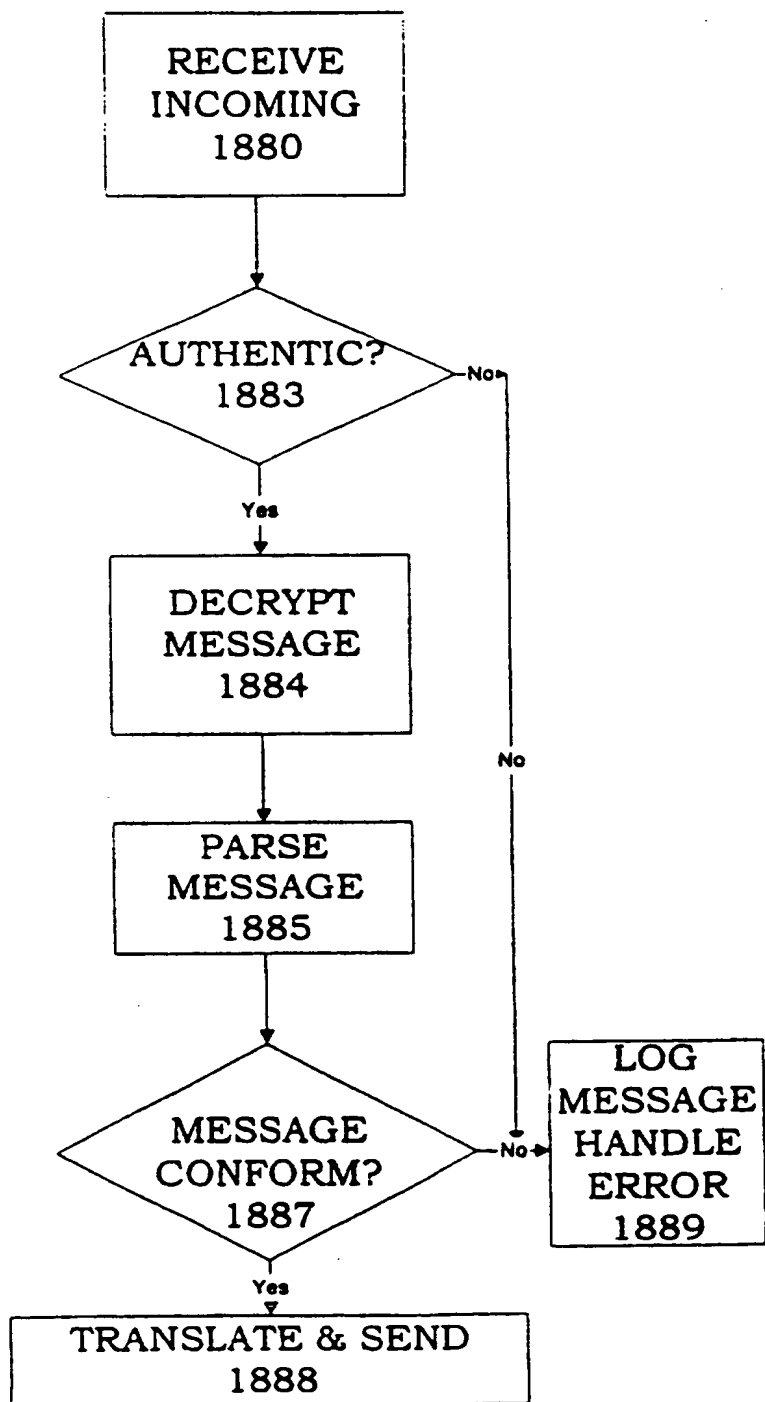


FIGURE 18C

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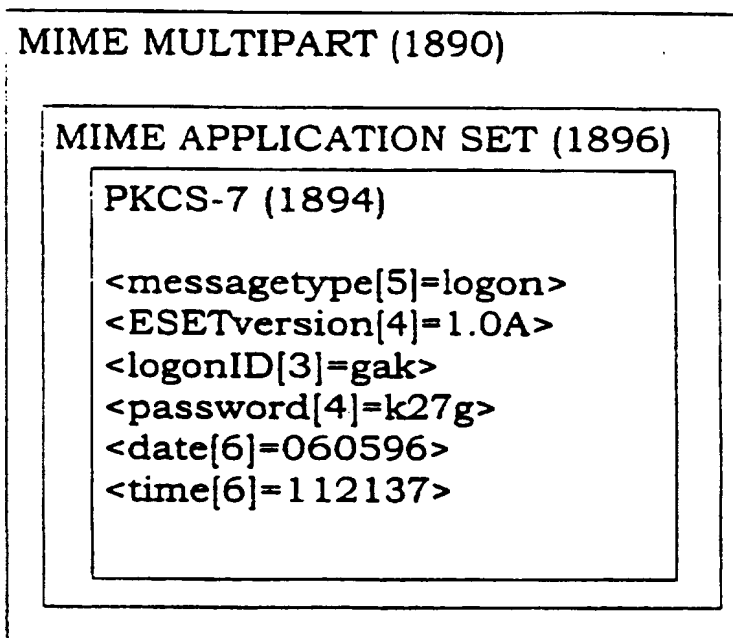


FIGURE 18D

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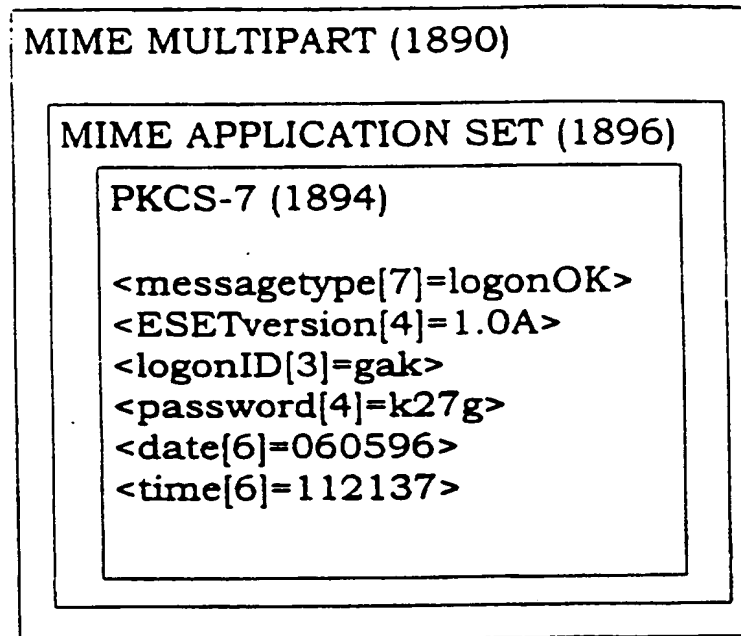


FIGURE 18E

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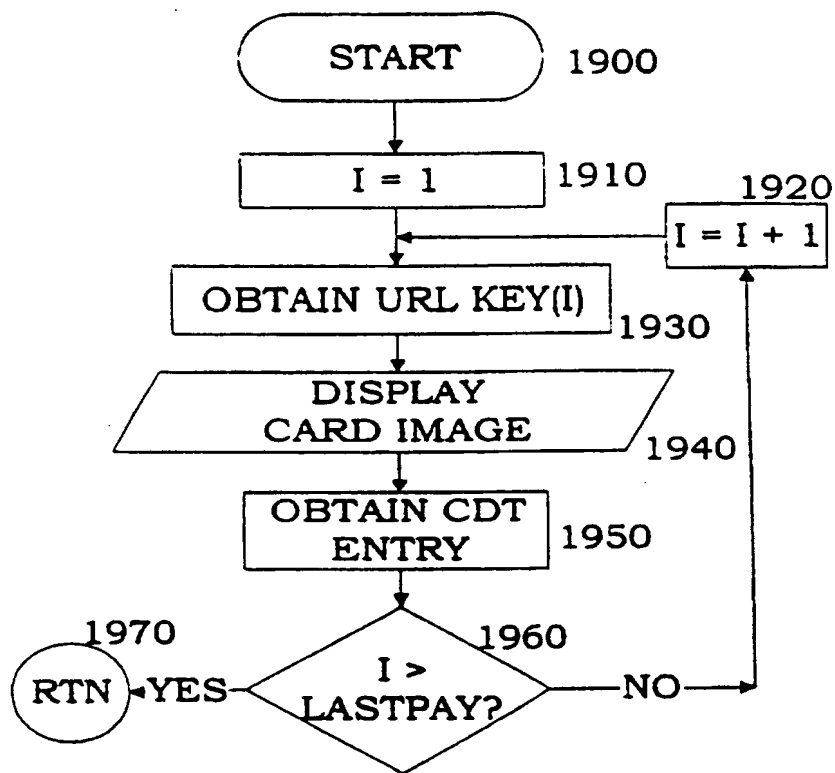


FIGURE 19

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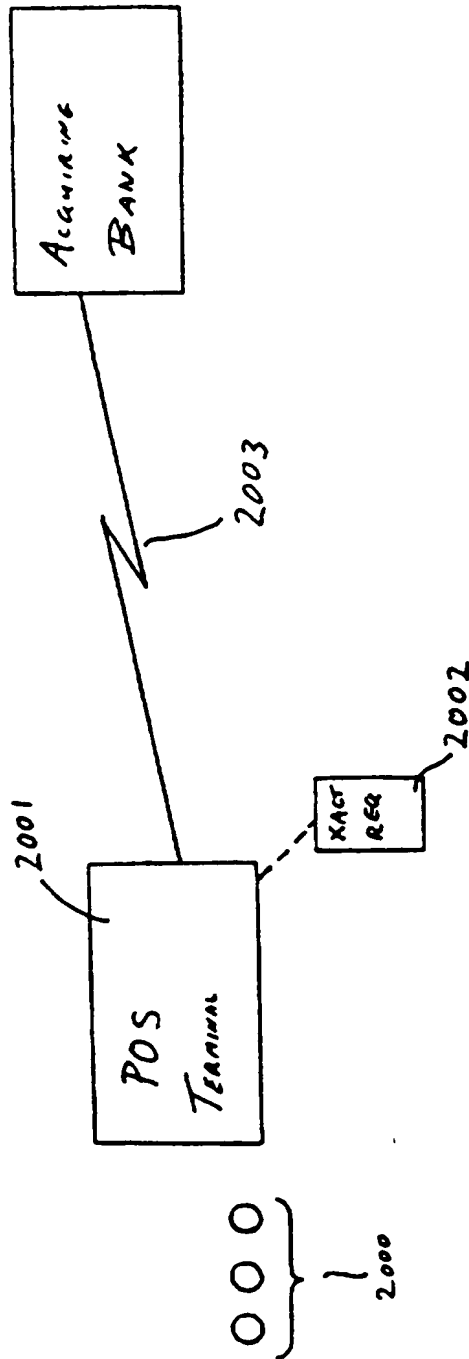


Fig. 20A

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2002

2006	TID	2005
	TRANSACTION TYPE	
	AMOUNT	
	CURRENCY TYPE	
	ACCOUNT No.	
	EXP. DATE	
	OTHER DATA	

FIG 20B

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VPOS

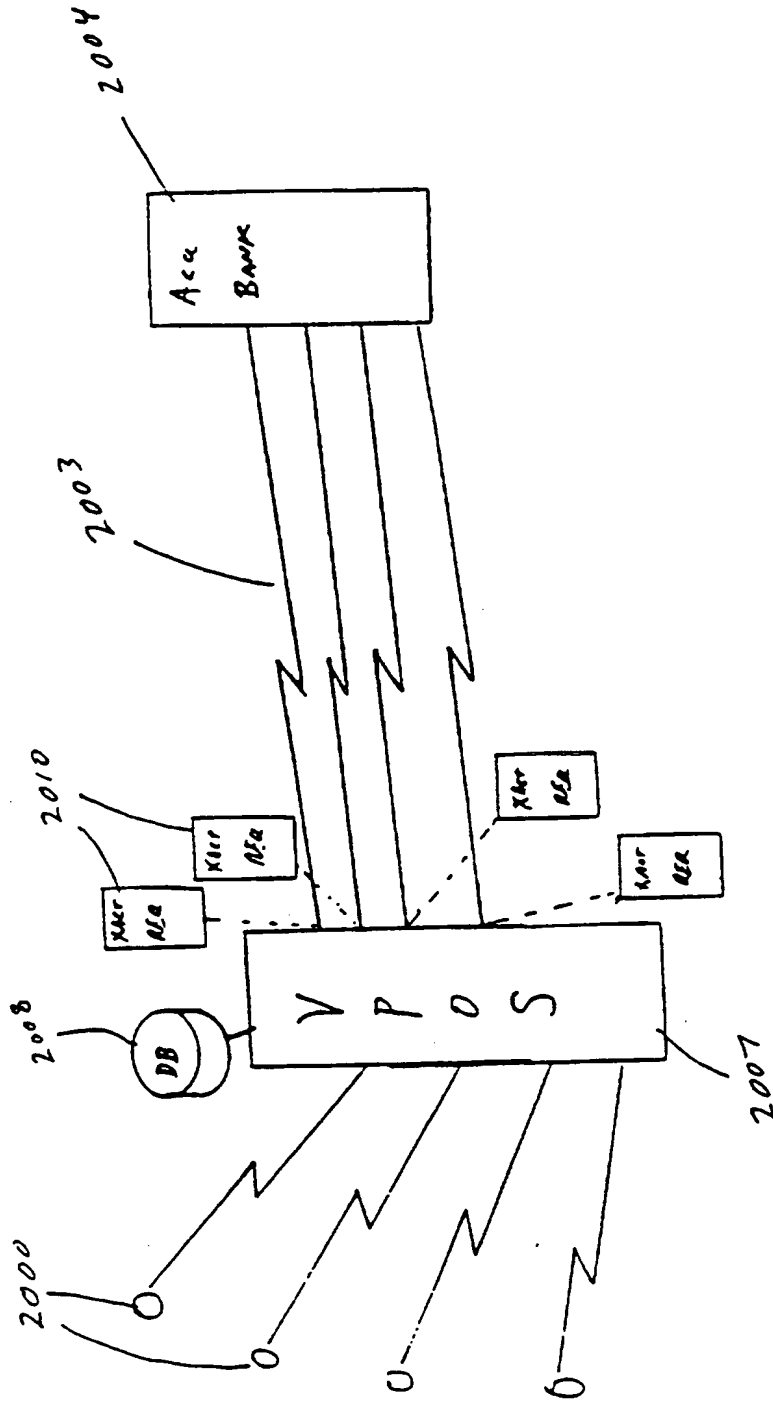


FIG. 20C

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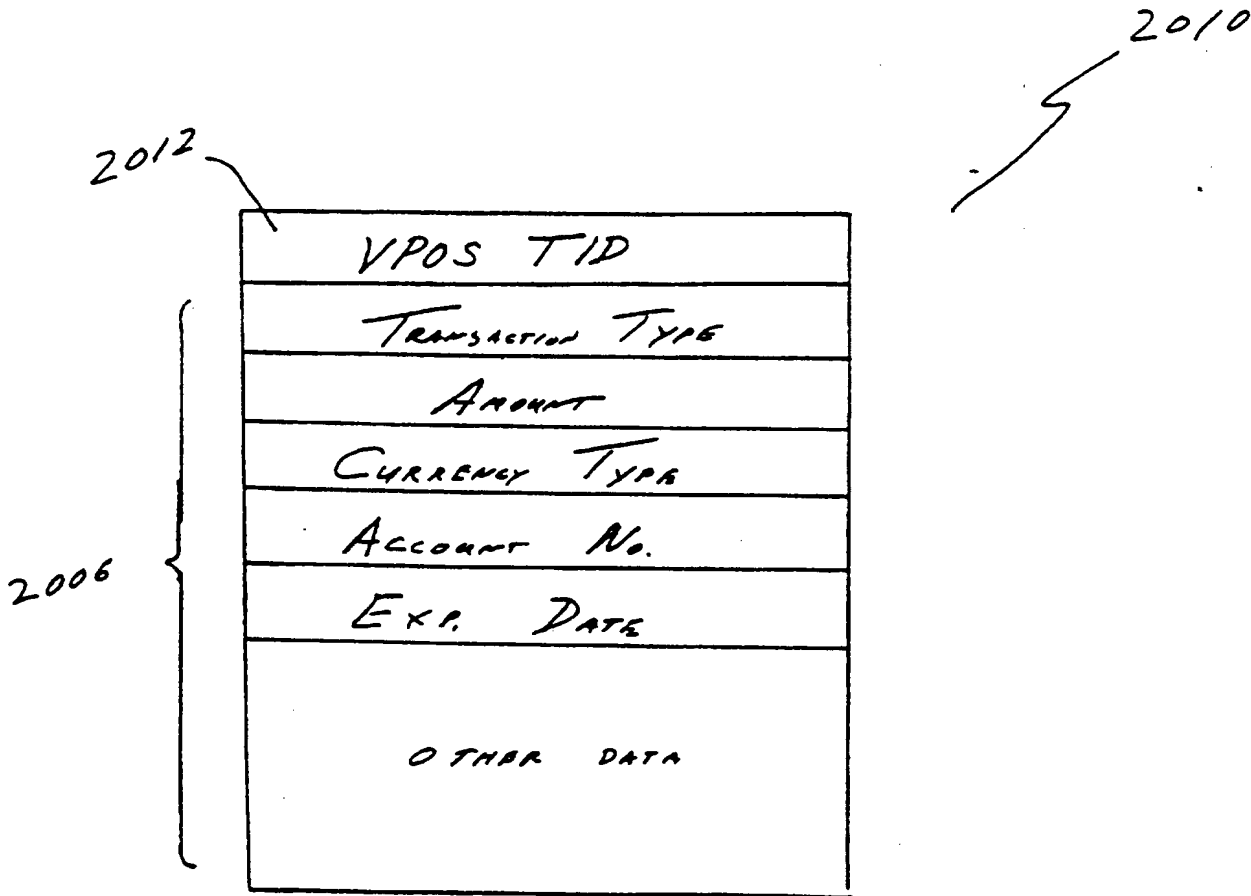


FIG. 20D

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DATA €

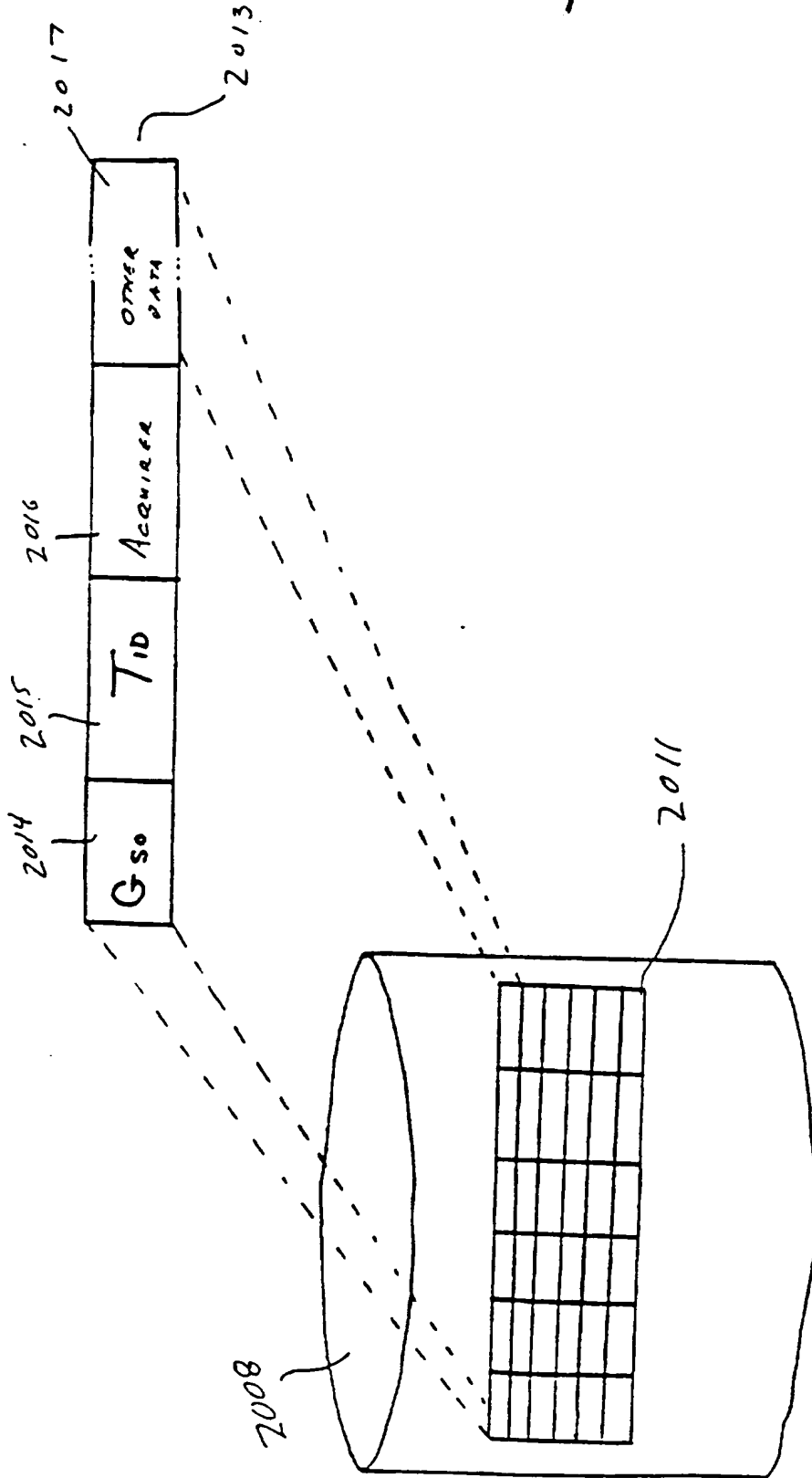


FIG. 20E

OVERVIEW
USING TID
OBTAIN & RELEASE

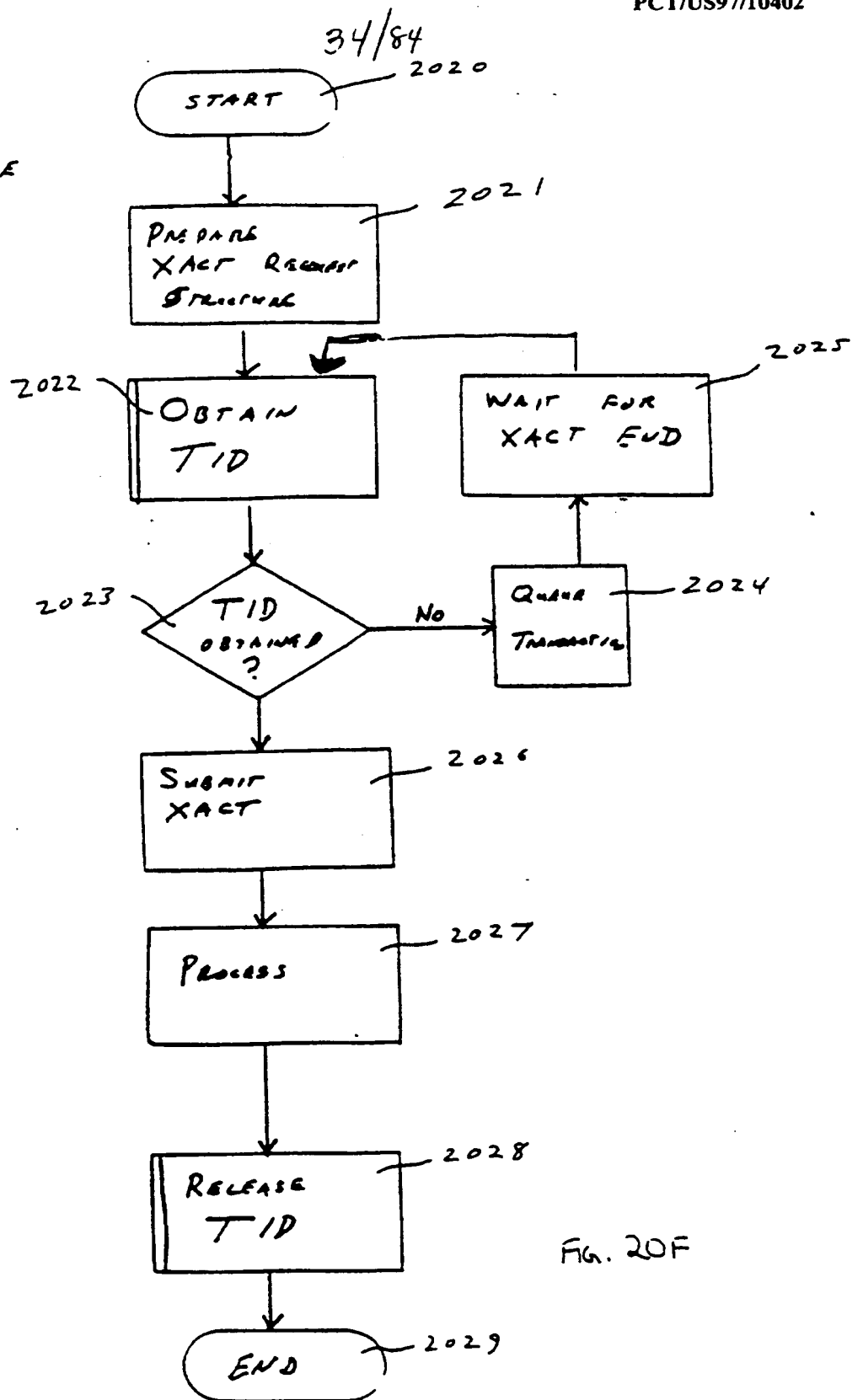


FIG. 20F

TID
OBTAIN
RTN

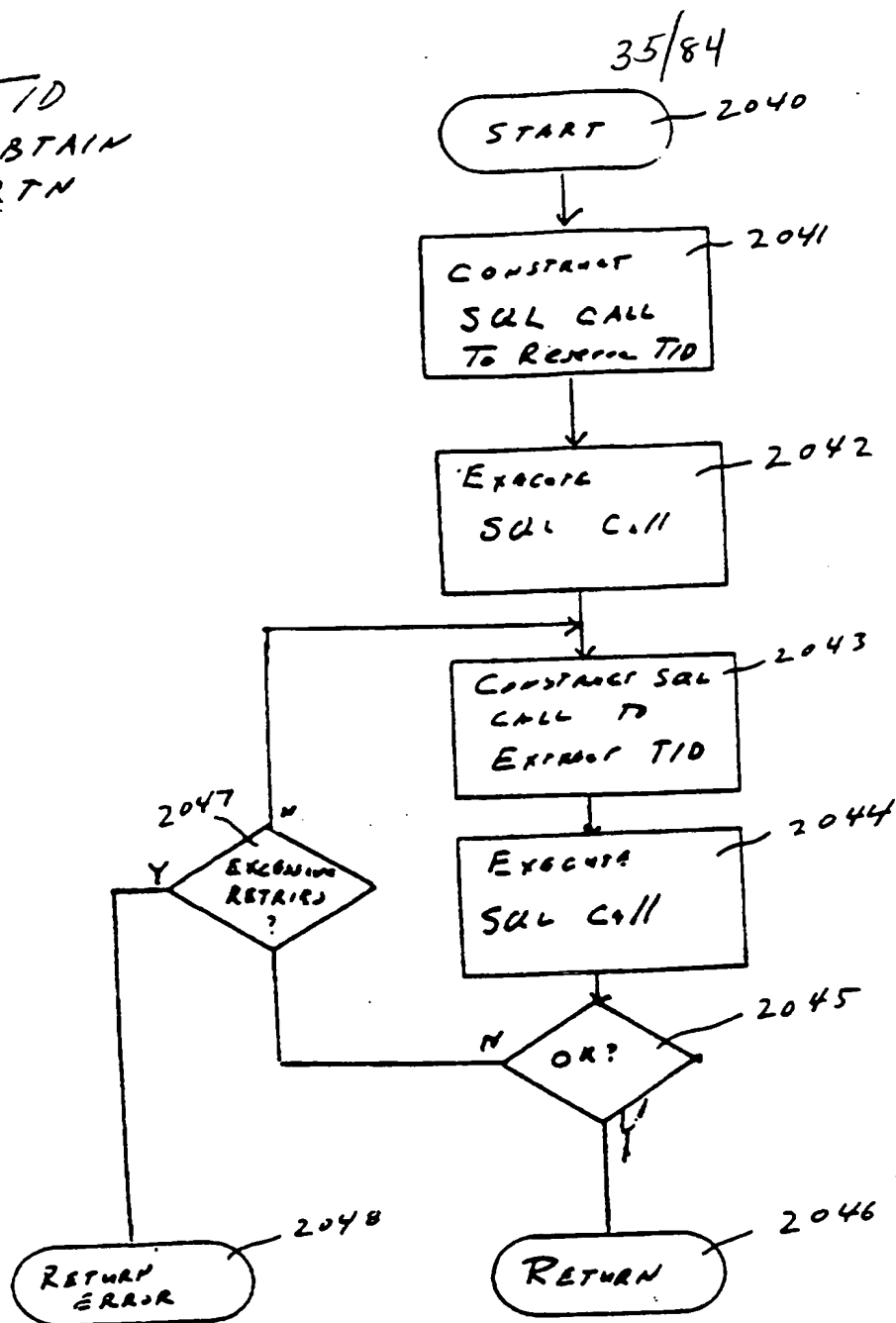


FIGURE 206

Release
TID
Routine

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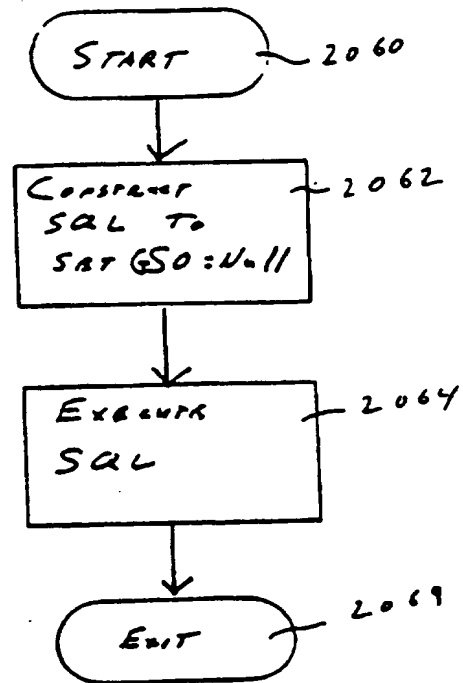


FIGURE 20H

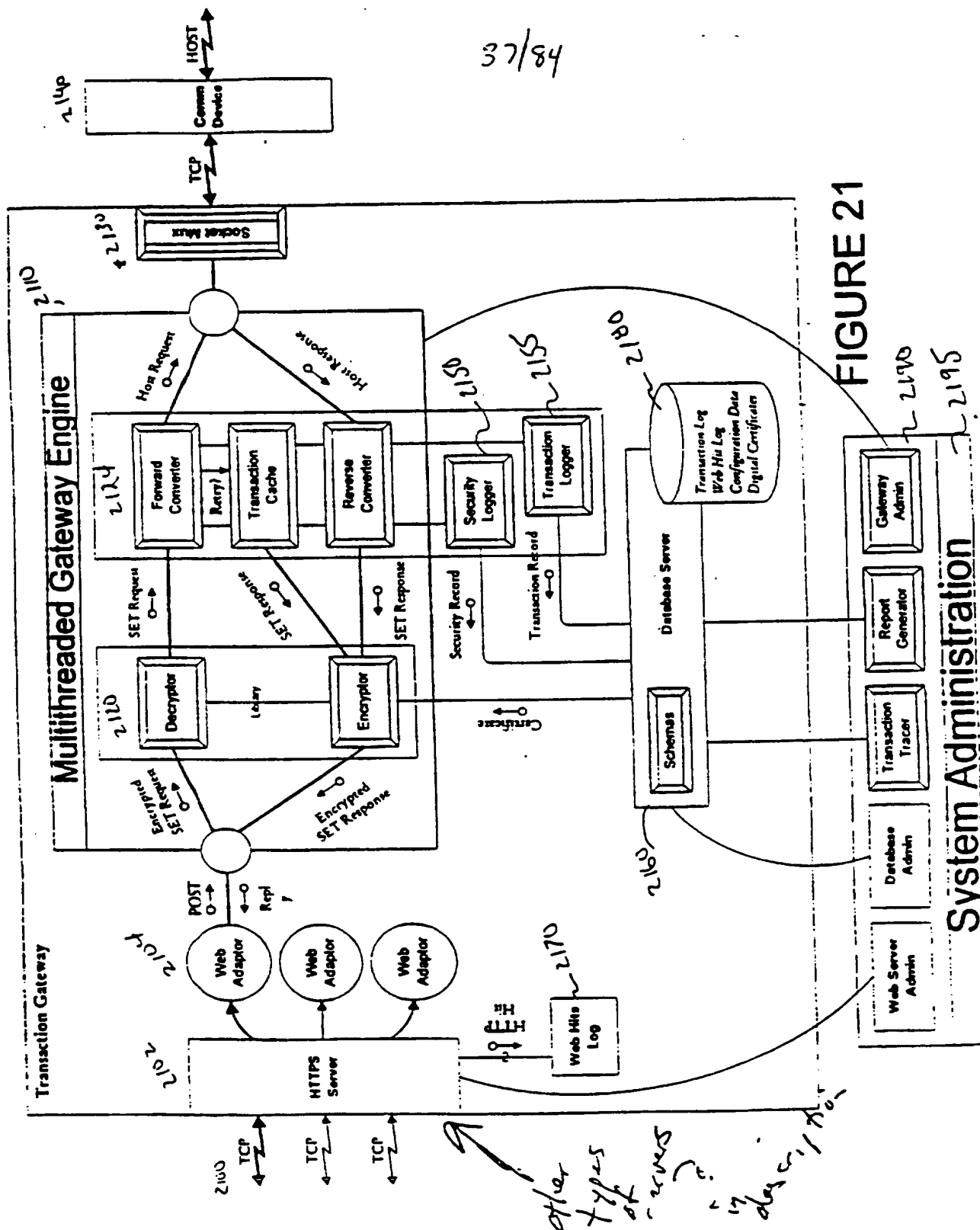


FIGURE 21

Legacy Space

Internet Space

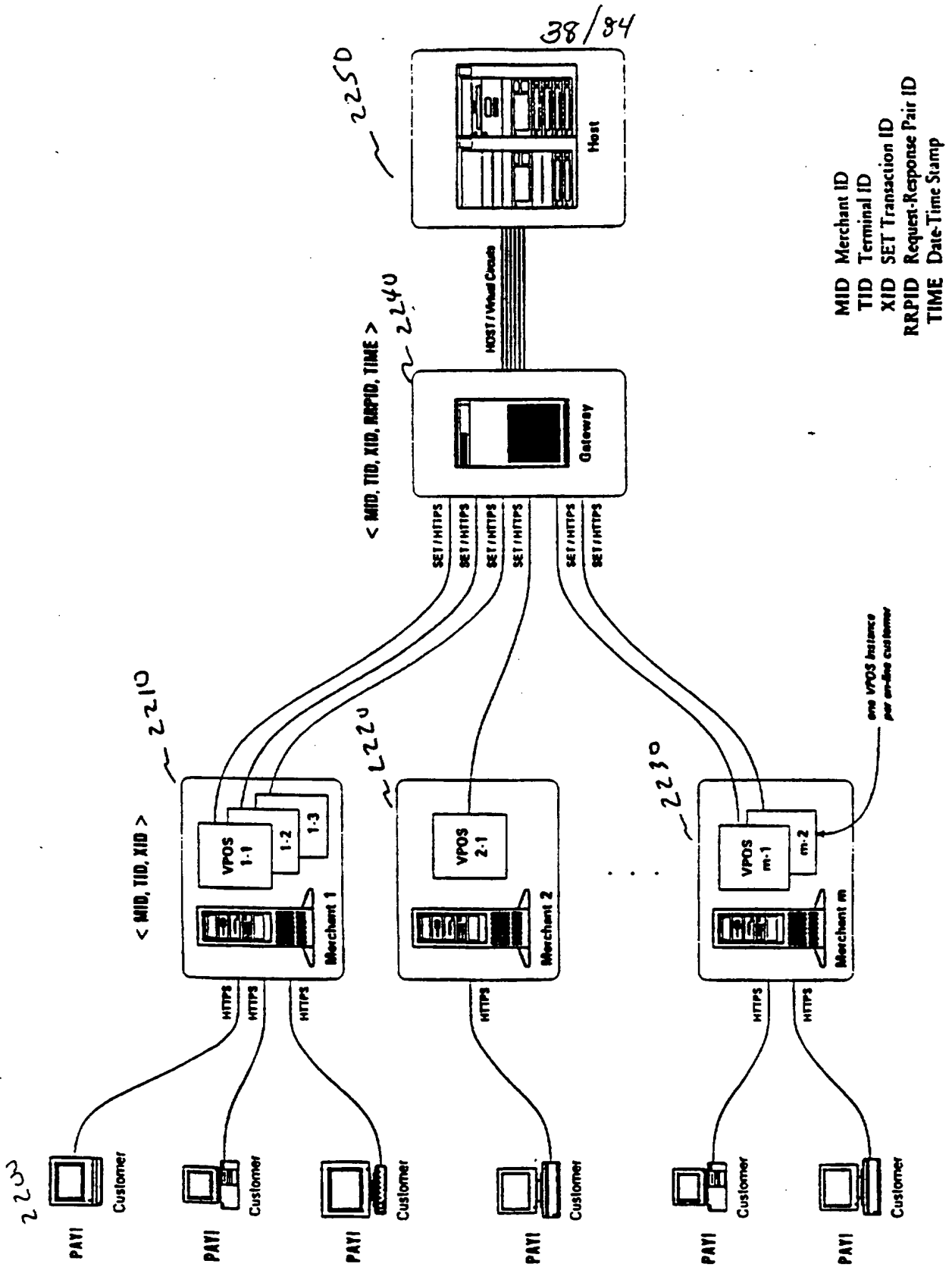


Figure 22

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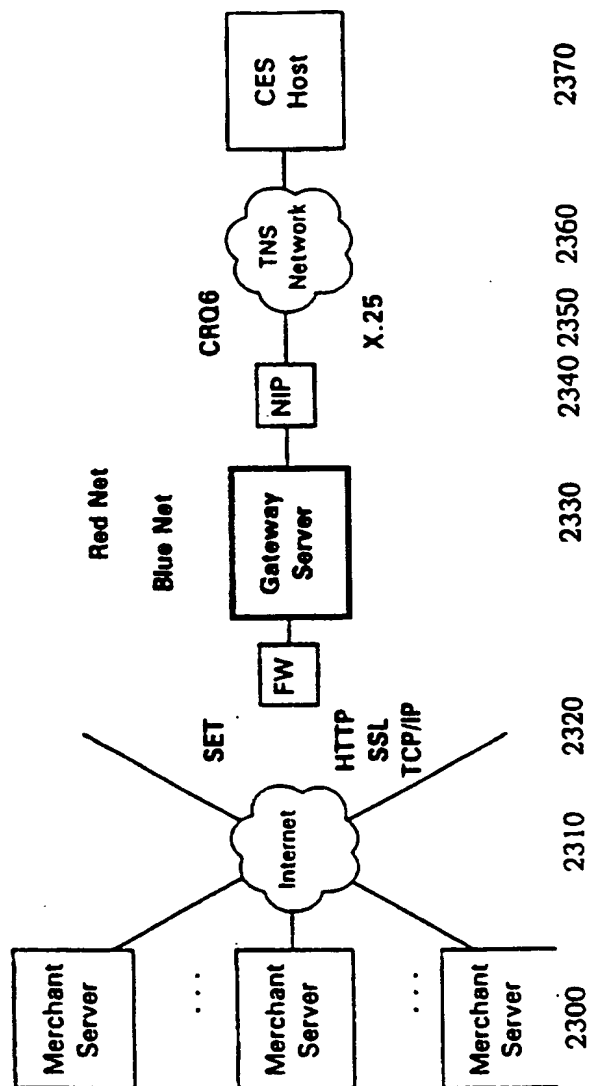


FIGURE 23

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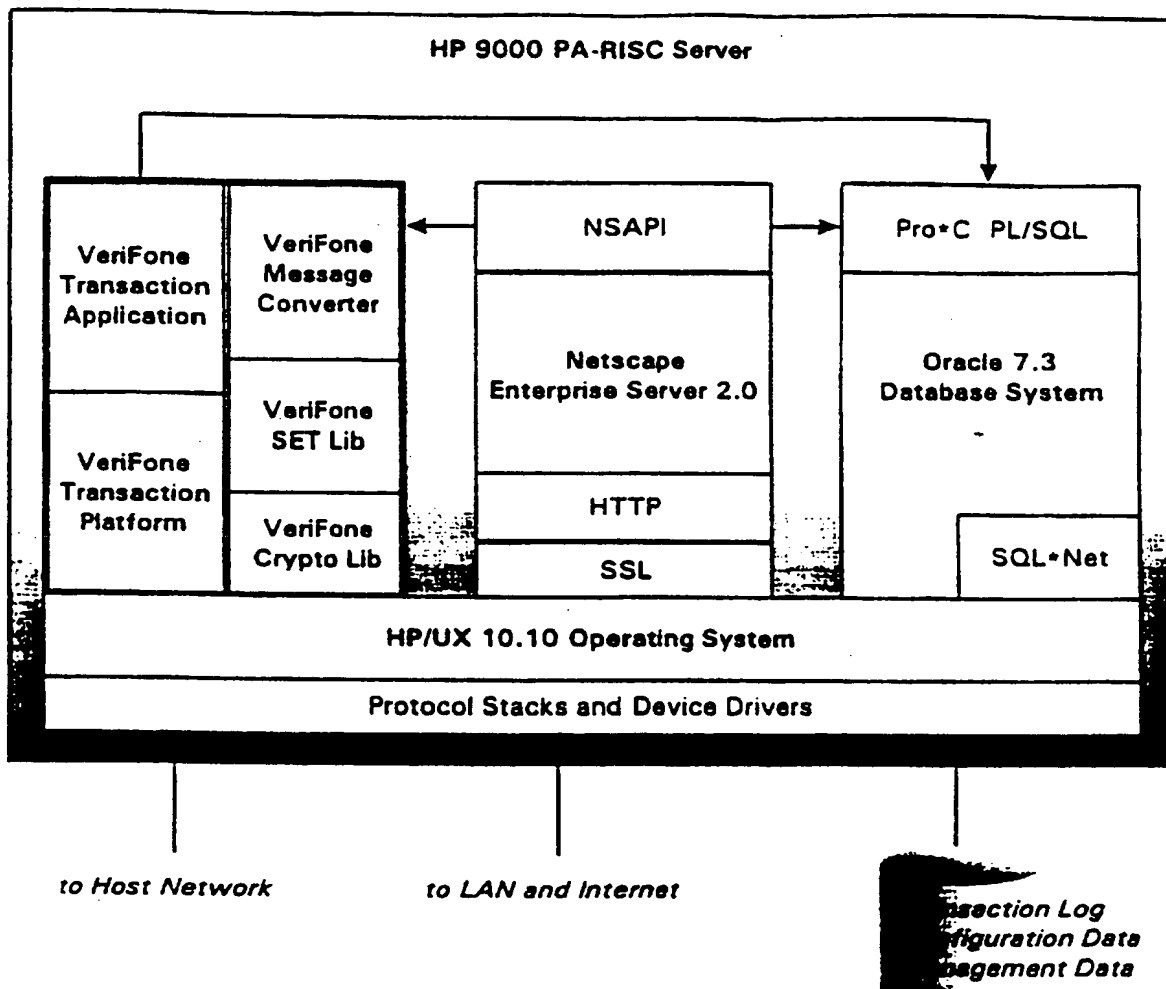


FIGURE 24

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vPOS Terminal Architecture

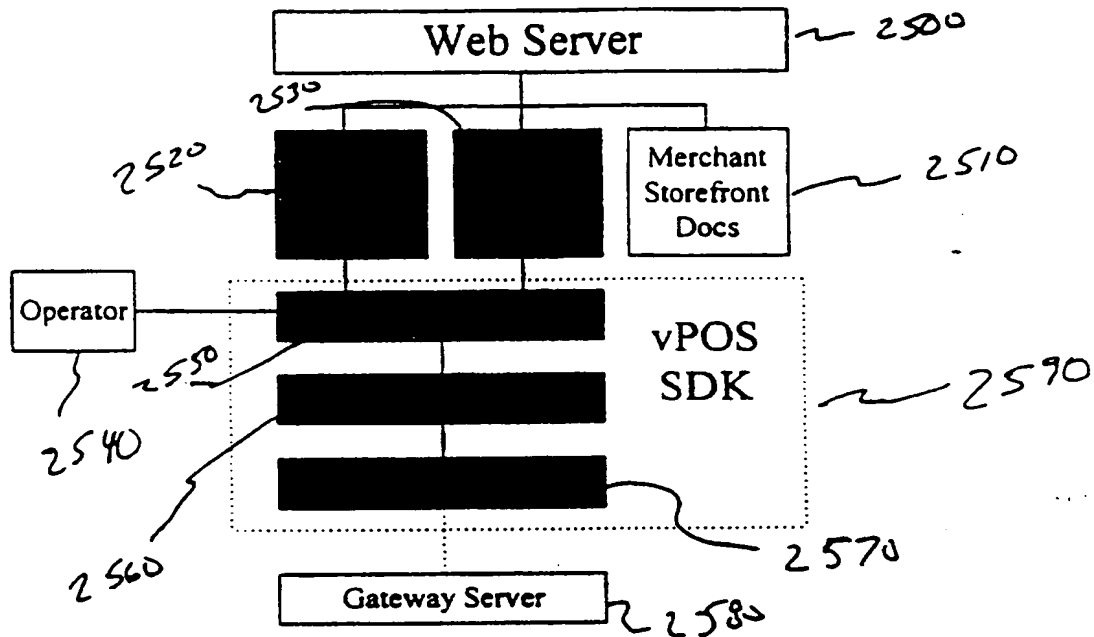


FIGURE 25

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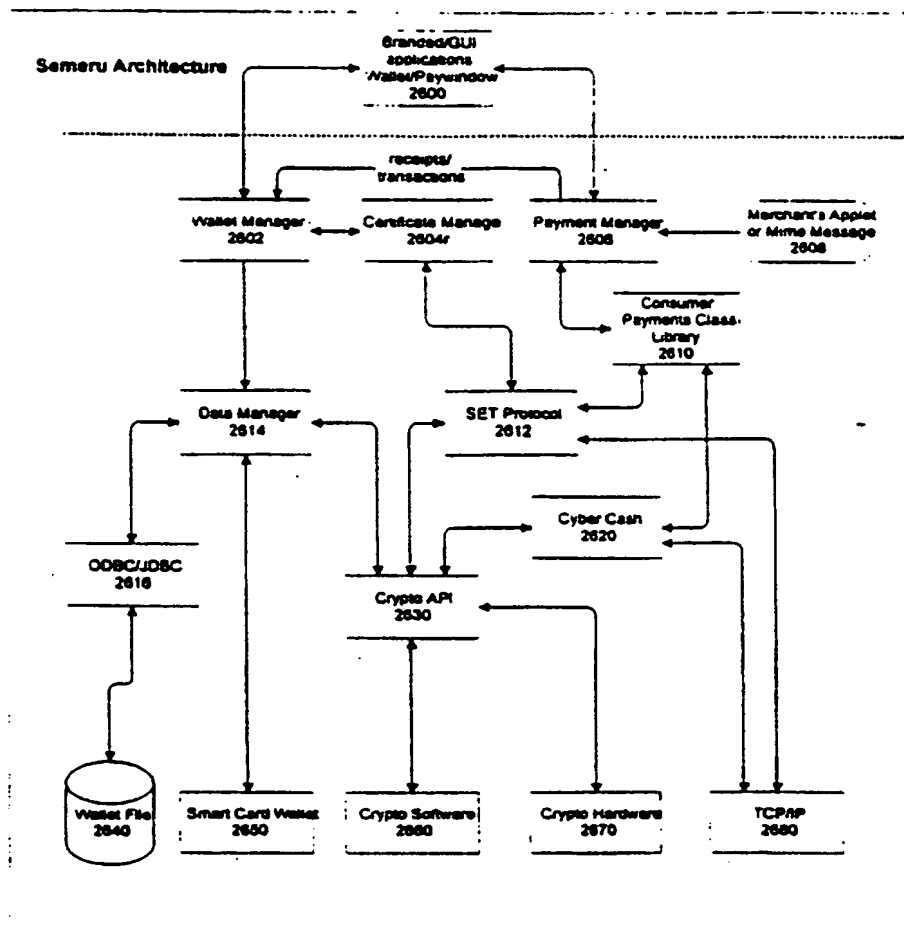


FIGURE 26

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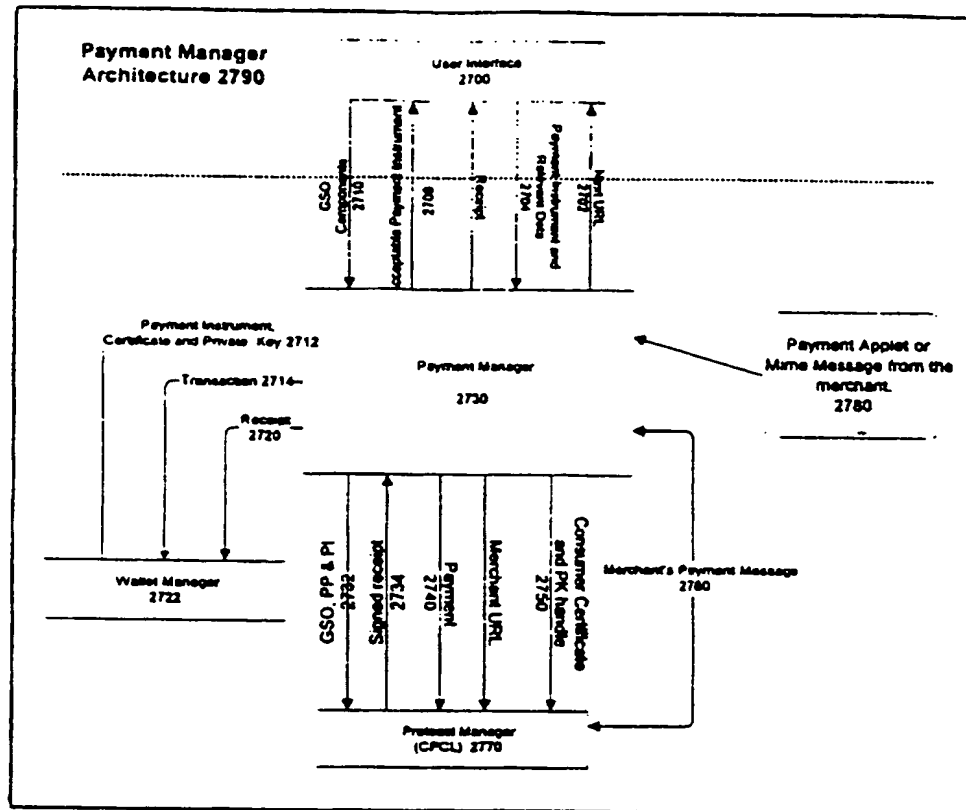


FIGURE 27

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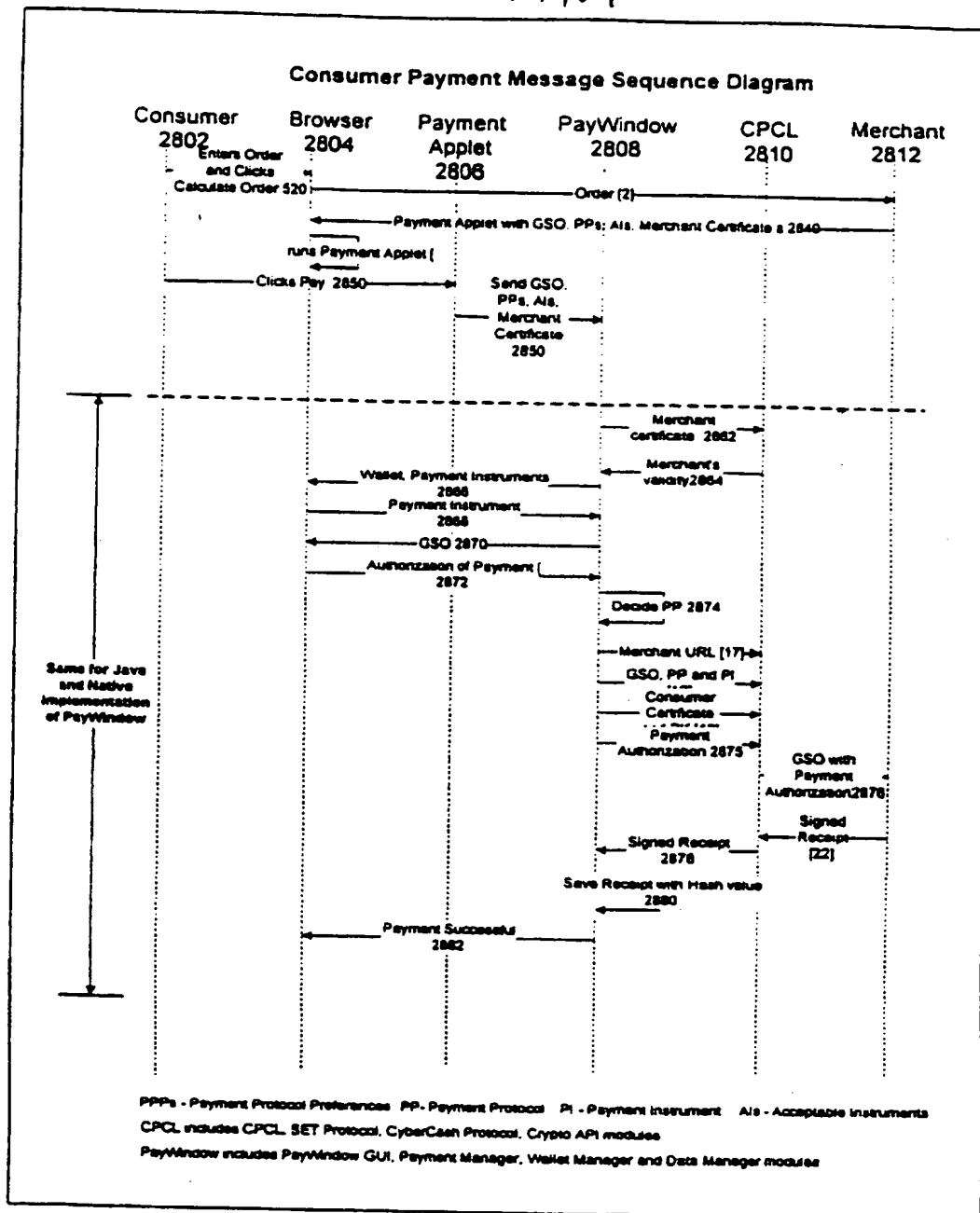


FIGURE 28

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Certificate Issuance Form

Please enter information into all fields. If a field does not apply to you, enter N/A.

Card Information

Card Number: 4417 2222 3333 9191

Expiry Date: 12/98

Personal Information

First Name: John

Middle: F.

Last: Smith

Home Phone #: 111 222-3333 (example: 555 555-5555)

Social Security Number: 111-22-3333 (example: 999-99-9999)

Date of Birth: 12/12/72 (month/day/year as 01/25/50)

Mother's Maiden Name: Jones (for security purposes only)

Address

Line 1: 141-22 Long Drive

Line 2: Kensington

Apt. #:

City: Palo Alto State: CA Zip: 94025

VeriFone Wallet Information

Icon Preference: ☒ Wallet

Password: ****

Confirm Password: ****

Figure 29

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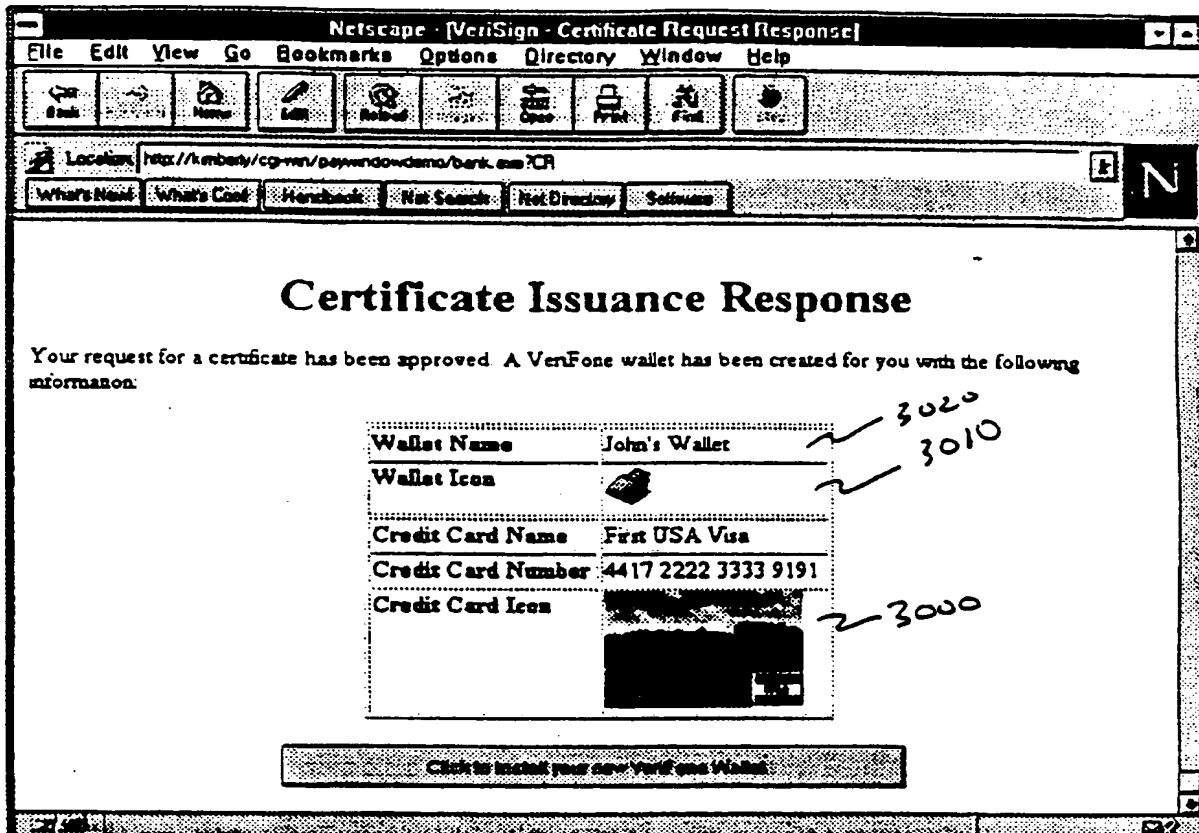


Figure 30

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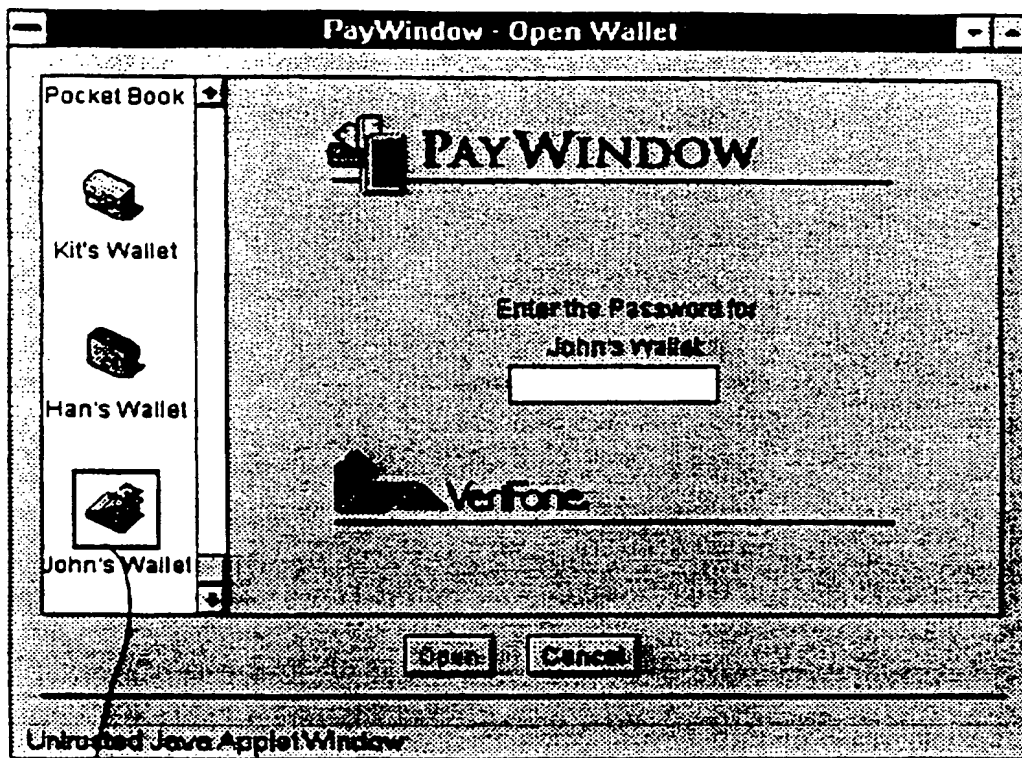


Figure 31

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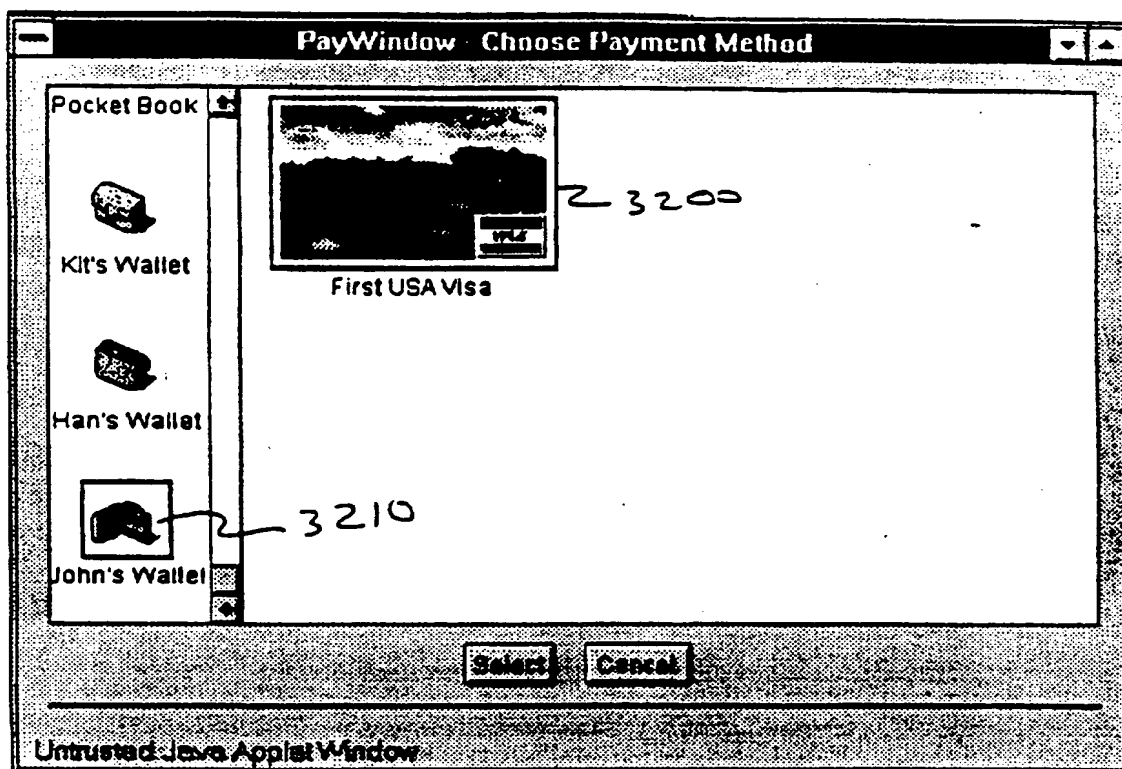


Figure 32

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PayWindow - John's Wallet



Wallet	Payment	Address
 First USA Visa	<p>Card Name: First USA Visa</p> <p>Cardholder Name: John F. Smith</p> <p>Card Type: VISA</p> <p>Number: 4417 2222 3333 9191</p> <p>Expires: 12/98</p> <p><input type="button" value="Certificate"/></p> <p><input checked="" type="checkbox"/> Use as default payment method</p> <p><input type="button" value="Add"/> <input type="button" value="Remove"/></p>	

Figure 33

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PayWindow - Authorization - John's Wallet

Payment Method	Order	Merchant	Ship To Address
 First USA Visa Change Payment Method	Hawaii's Best Espresso 1 Kona Maltapa Regular : 18.39 SH : 8.00 Tax : 1.12 Total : 27.11		

I Agree To Pay The Total Amount Shown Below
According To The Card Issuer Agreement.
Amount: \$ 27.11
I Herby Digitally Sign This Transaction

Accept **Cancel**

Figure 34

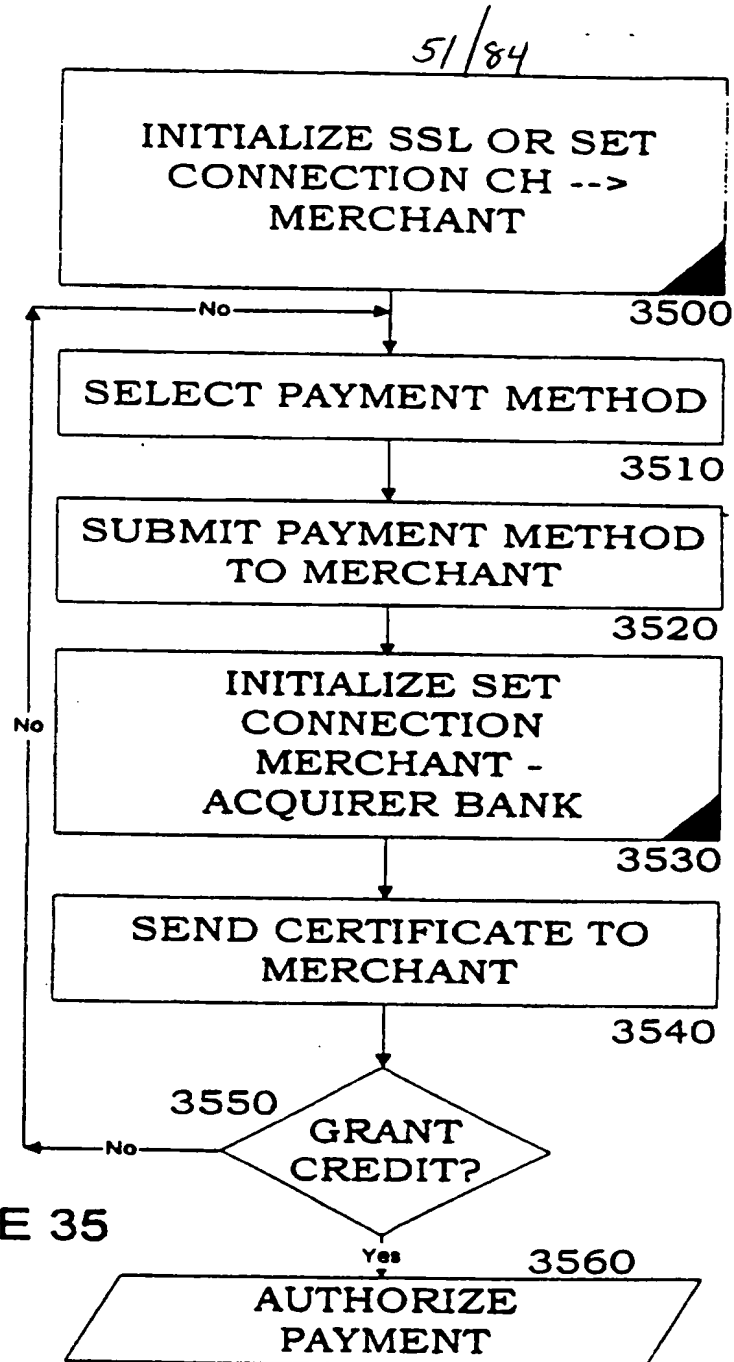


FIGURE 35

Virtual Point of Sale Terminal

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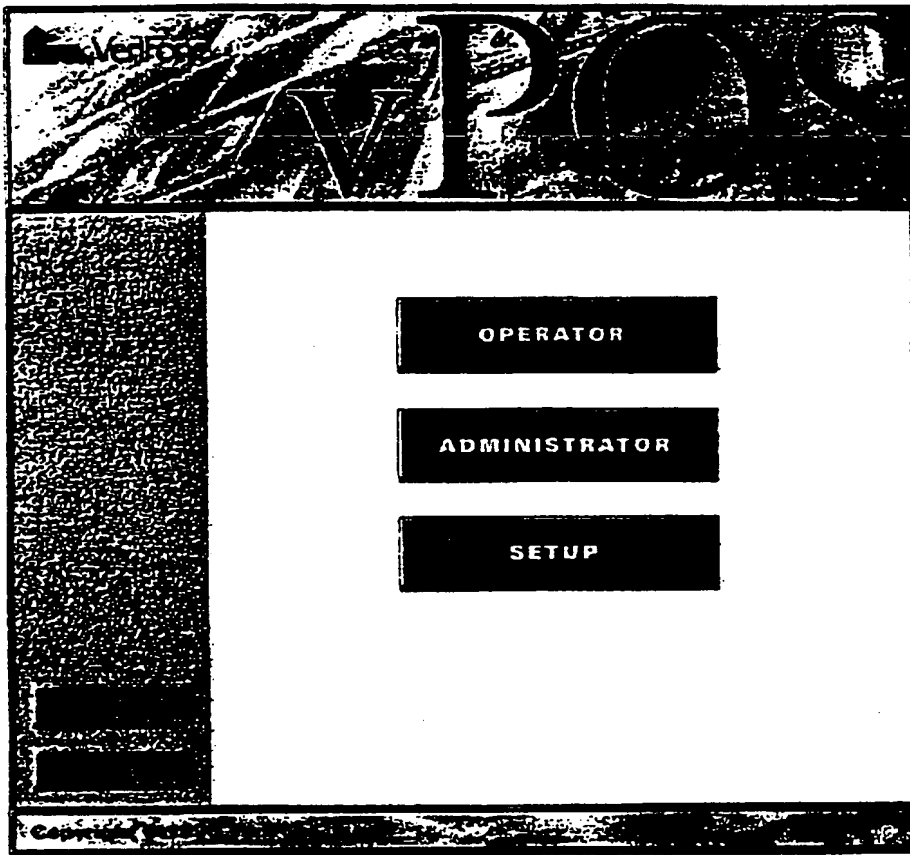


FIGURE 36

Operator POS Terminal

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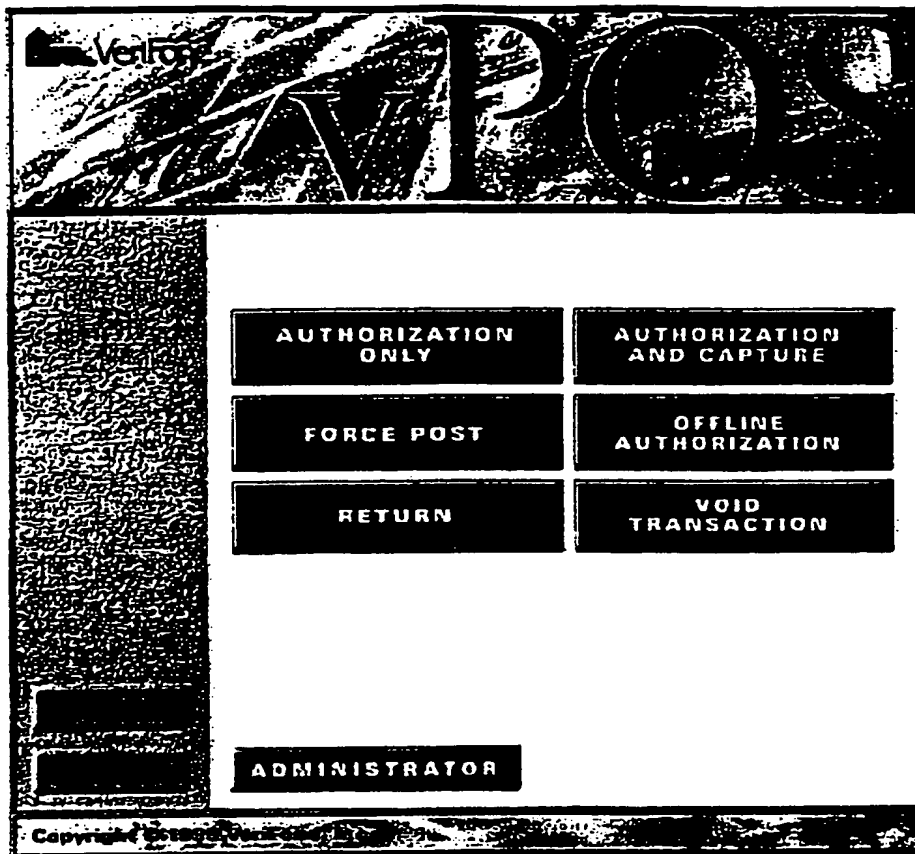
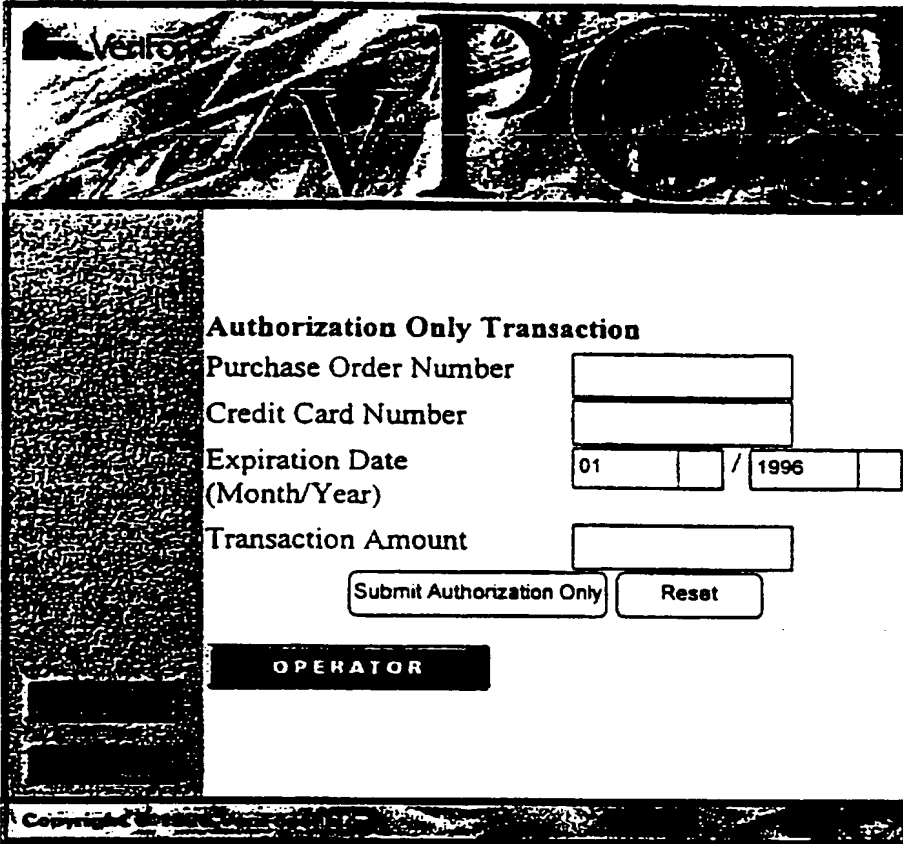


FIGURE 37

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Authorization Only Transaction



The screenshot shows a Verifone VPC terminal interface. At the top, the 'Verifone VPC' logo is displayed against a background of US dollar bills. Below the logo, the title 'Authorization Only Transaction' is centered. The form contains several input fields: 'Purchase Order Number' (a single line), 'Credit Card Number' (a single line), 'Expiration Date (Month/Year)' (split into two boxes, with '01' in the first and '1996' in the second, separated by a slash), and 'Transaction Amount' (a single line). Below these fields are two buttons: 'Submit Authorization Only' and 'Reset'. At the bottom left of the screen, there is a black rectangular area labeled 'OPERATOR'.

Figure 38

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Administrator POS Terminal

VeriFone VPOS

TERMINAL TOTALS REPORT	TERMINAL BATCH REPORT
HOST TOTALS REPORT	TRANSACTION REPORT
MONITOR TRANSACTIONS	RECONCILE

OPERATOR

Copyright © 1997 VeriFone Inc.

Figure 39

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Terminal Totals Report



Terminal Totals Report

Note: The transaction is not currently implemented. The report below is a sample.

Overall Terminal Totals

Sales	Trans. Count	25
	Amount	\$6161.70
Credits	Trans. Count	5
	Amount	(\$11.70)
Net Sales		\$6150.00

Visa Totals

Sales	Num. of Trans.	5
	Amount	\$1232.34
Credits	Num. of Trans.	1
	Amount	(\$2.34)
Net Sales		\$1230.00

MasterCard Totals

Sales	Trans. Count	5
	Amount	\$1232.34
Credits	Trans. Count	1
	Amount	(\$2.34)
Net Sales		\$1230.00

Discover Totals

Sales	Num. of Trans.	5
	Amount	\$1232.34
Credits	Num. of Trans.	1
	Amount	(\$2.34)
Net Sales		\$1230.00

American Express Totals

Sales	Num. of Trans.	5
	Amount	\$1232.34
Credits	Num. of Trans.	1
	Amount	(\$2.34)
Net Sales		\$1230.00

FIGURE 40

Terminal Totals Report

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JCB Totals		
Sales	Num. of Trans.	57
	Amount	\$1232.34
Credits	Num. of Trans.	1
	Amount	(\$2.34)
Net Sales		\$1230.00

ADMINISTRATOR

Copyright 1997

Figure 4/

Terminal Setup

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Terminal Setup

Terminal Tables Configuration

Card(s) Definition Table

Review

Acquirer(s) Definition Table

Review

Merchant Configuration Table

Review

Help



Figure 42

Update Card Definition Table

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Content-type: text/html



Transaction Type

CDT List Update/Review

Cards accepted by the merchant

Visa



FIGURE 43

Review Card Definition Table

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Transaction Type	CDT Record Update/Review
Card	Visa
PANHi	<input type="text" value="4999"/>
PANLo	<input type="text" value="4000"/>
Acquirer	<u>VFITest</u>
BrandID	<input type="text" value="VeriFone Test"/>
CardPicture	<input type="text" value="/vpos/icons/paypage/visa.jp"/>
Maximum PAN Digits	<input type="text" value="16"/>
Minimum PAN Digits	<input type="text" value="16"/>
<input type="button" value="Update"/>	<input type="button" value="Reset"/>
	

FIGURE 44

Update Acquirer Definition Table

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Content-type: text/html



Transaction Type ADT List Update/Review
Acquirer(s) for the the merchant

VFITest



Figure ~~44~~ 45

Review Acquirer Definition Table

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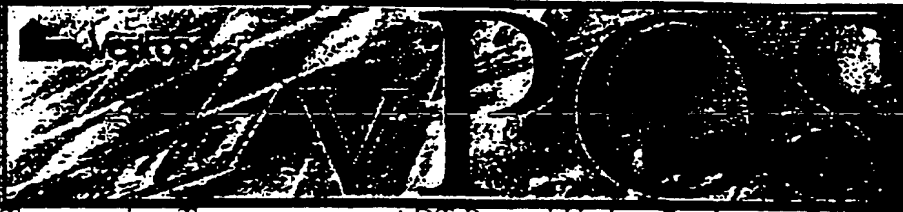


	
Transaction Type	ADT Record Update/Review
Acquirer	VFITest
MerchId	shouldbeserialnum
Batch Number	
HostName	VeriFone Test Gatewa
Transaction Ref Number	0
Response Time Out	60
Number of Retries	1
Acquirer Banner	/vpos/icons/paypage/vfitest
<input type="button" value="Update"/>	<input type="button" value="Reset"/>
	

Figure 46

Update Merchant Configuration Table

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Transaction Type MCT Update

Merchant Name

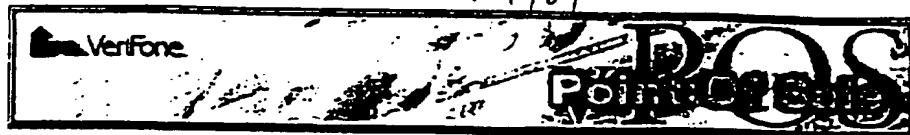
Merchant e-mail

Merchant URL

Merchant Postal Address

Copyright 1997 VPC

Figure 47



Order Number 834100050

Bill To

Account Number



Name on Card Good Through /

Address Line 1

Address Line 2

City

State/Province

Country

Zip/Postal Code

Email

Phone

If you wish to have billing defaults set in your browser, check this box

Total = \$ 59.99

By pressing the PAY button I agree to pay the above total amount
according to the card issuer agreement



FIGURE 48

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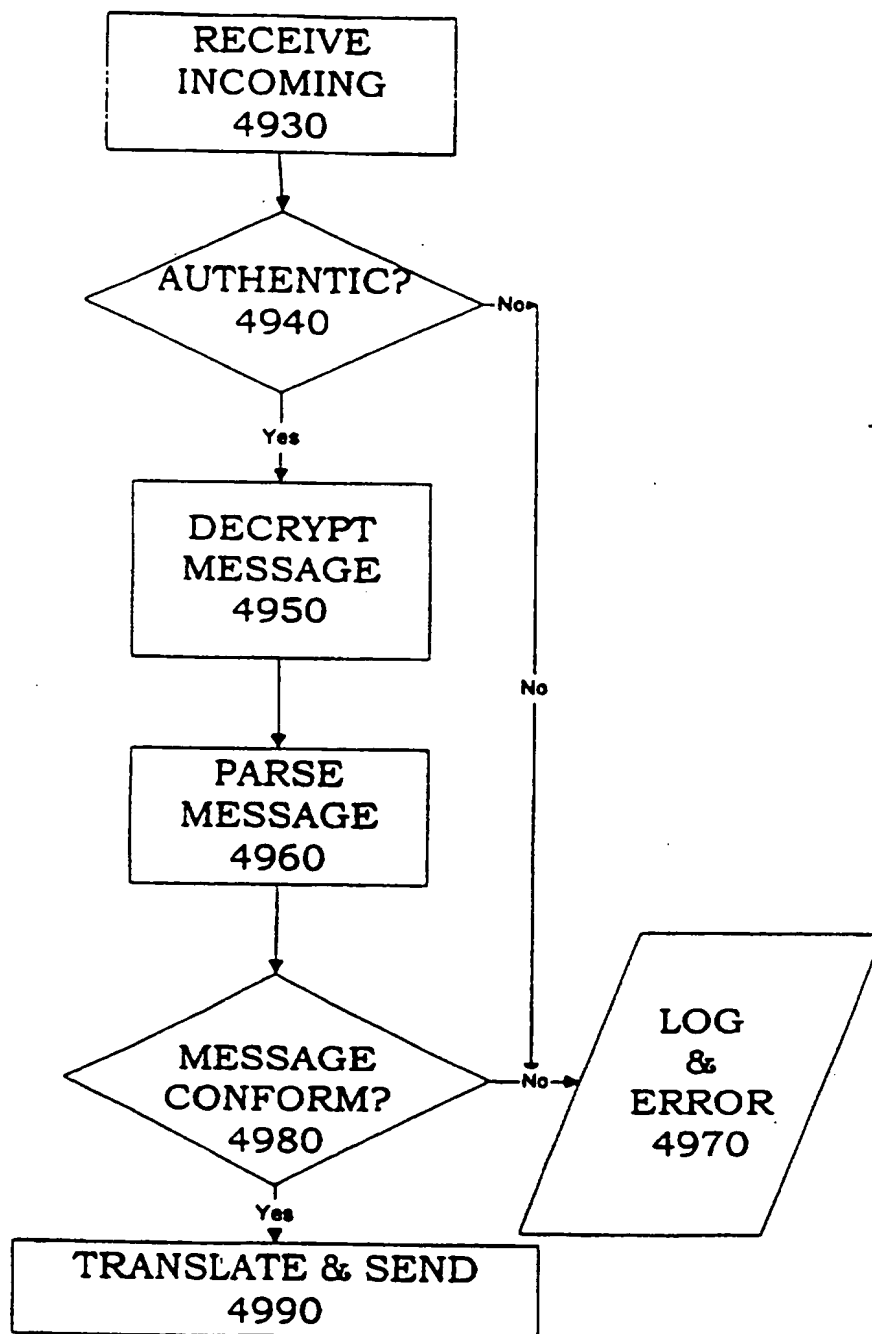


FIGURE 49

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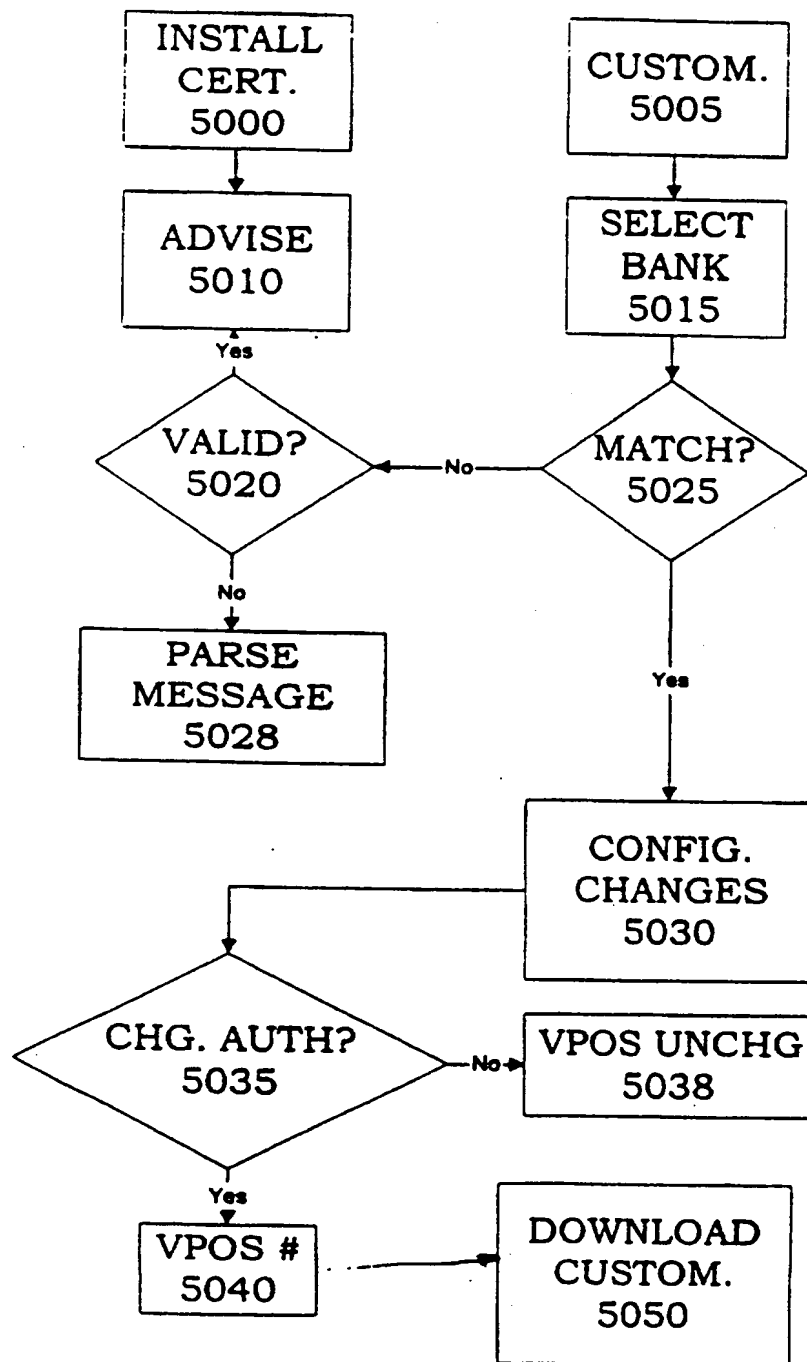


FIGURE 50

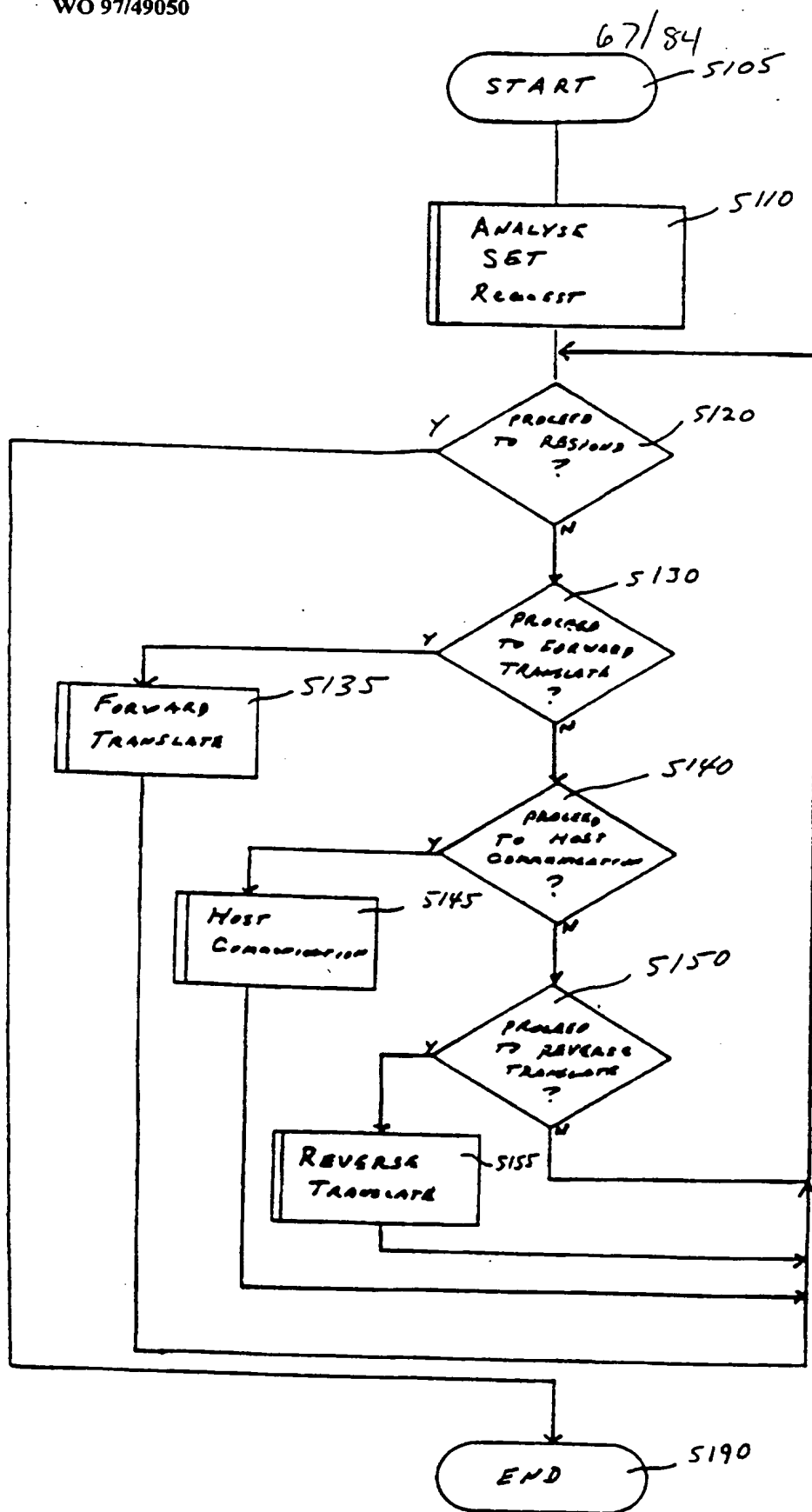
FIG. 51

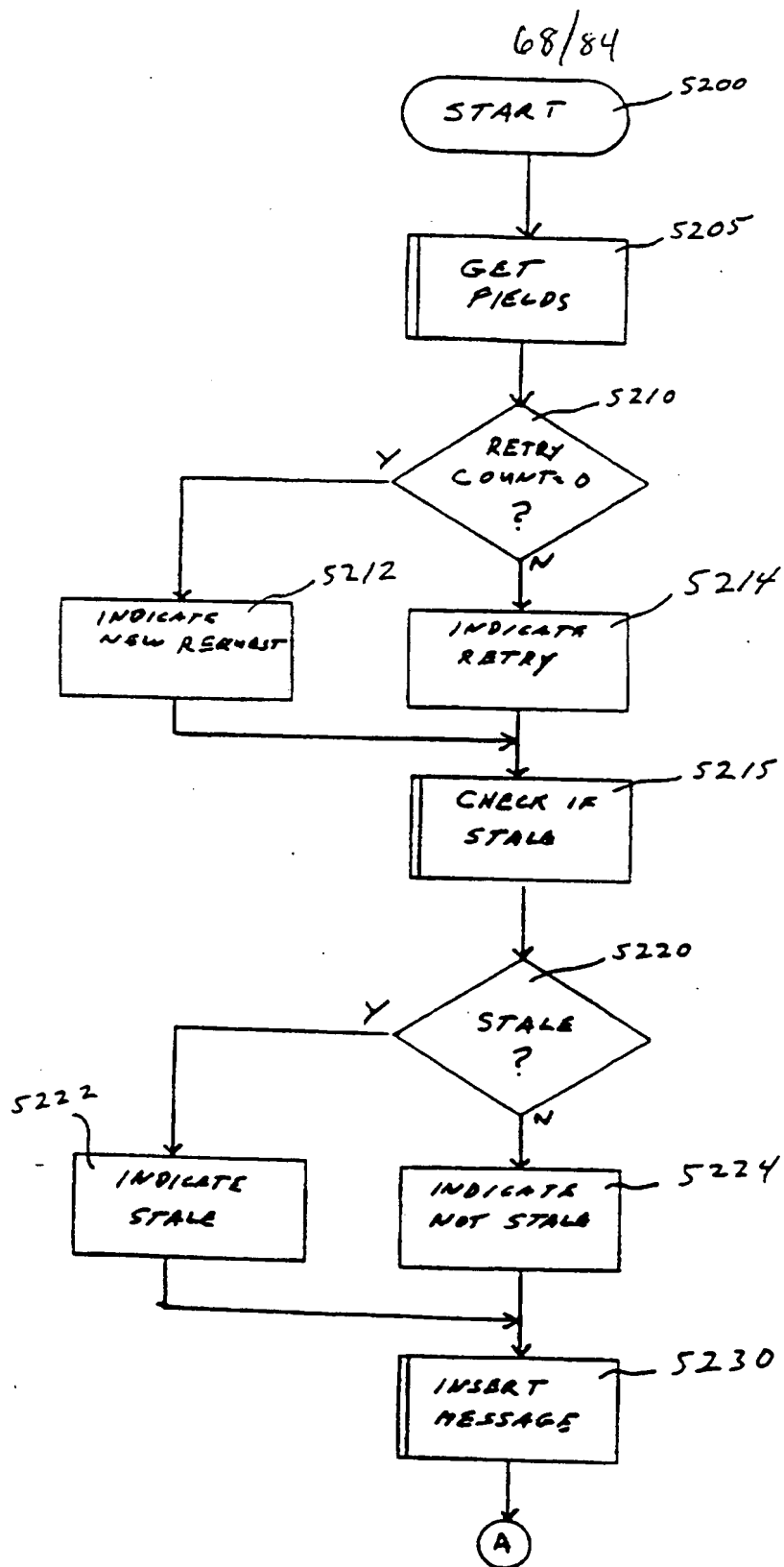
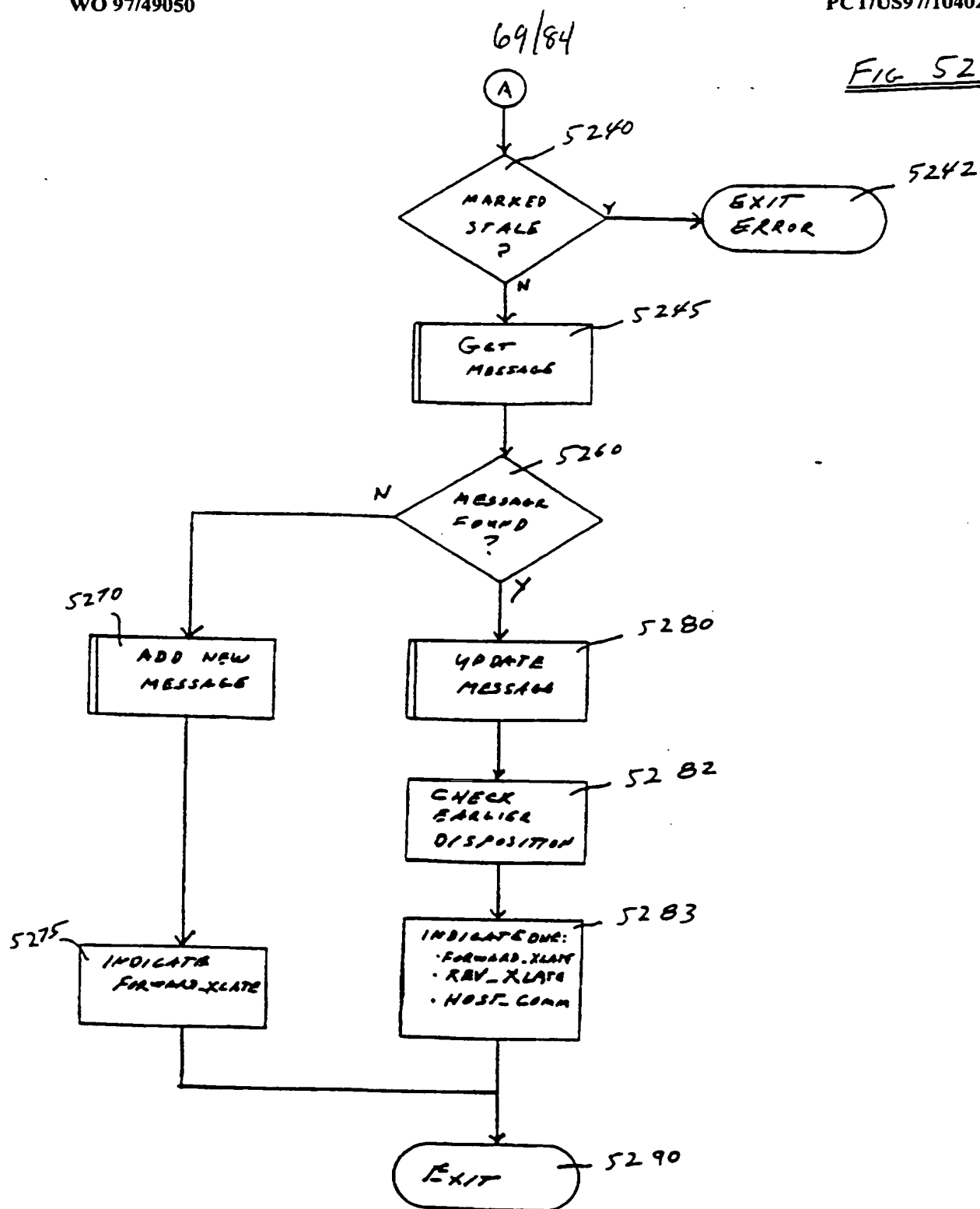
Fig 52A

FIG 52B

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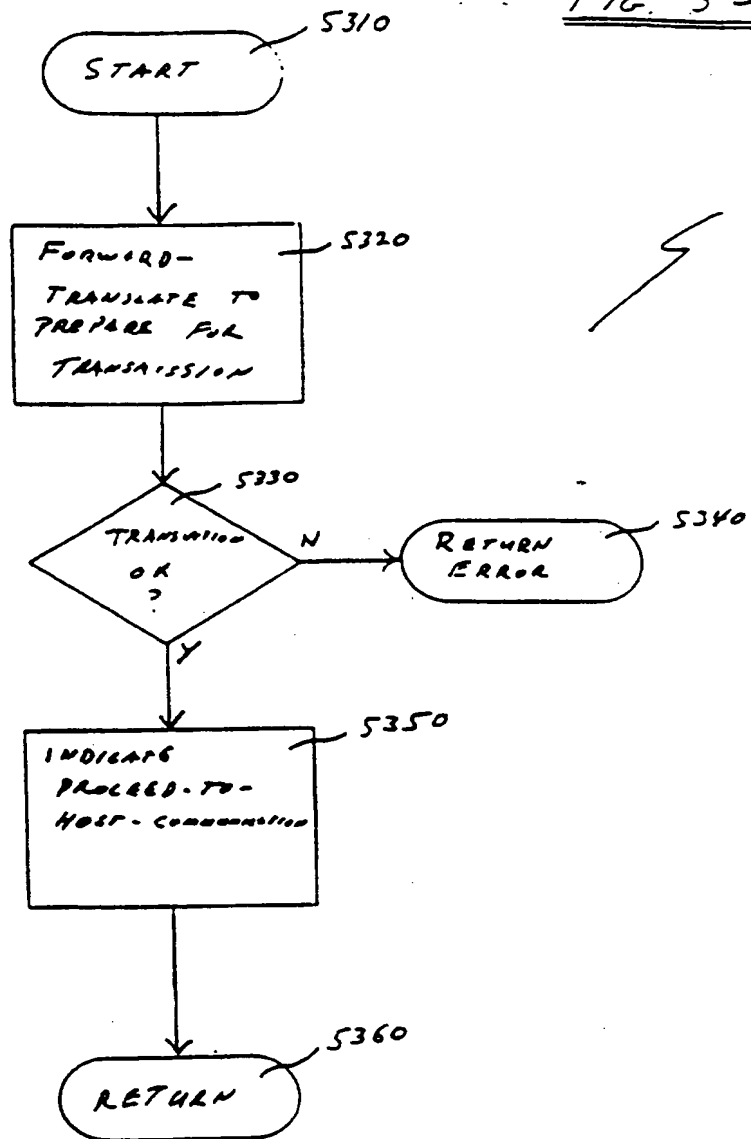
FIG. 53

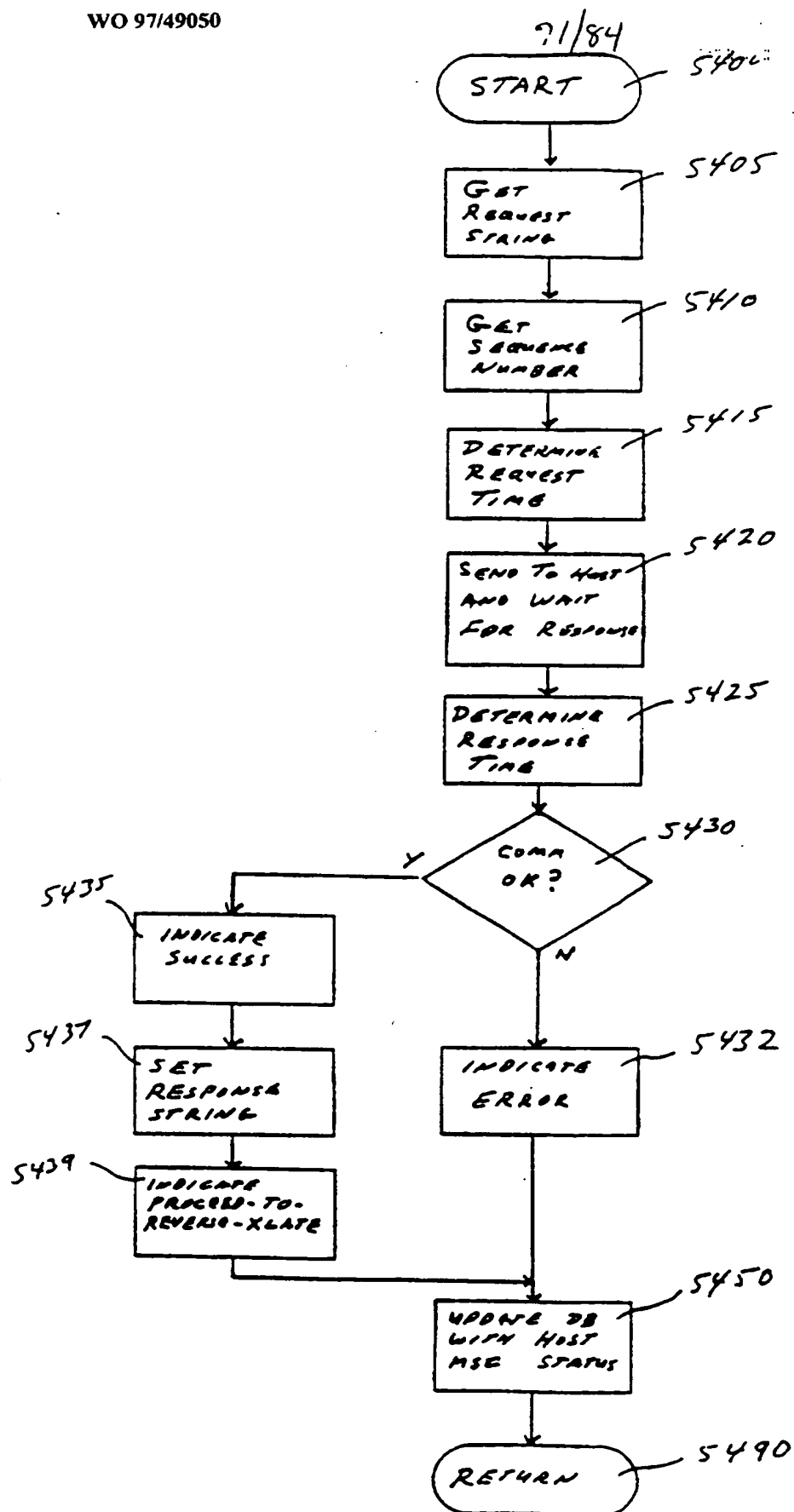
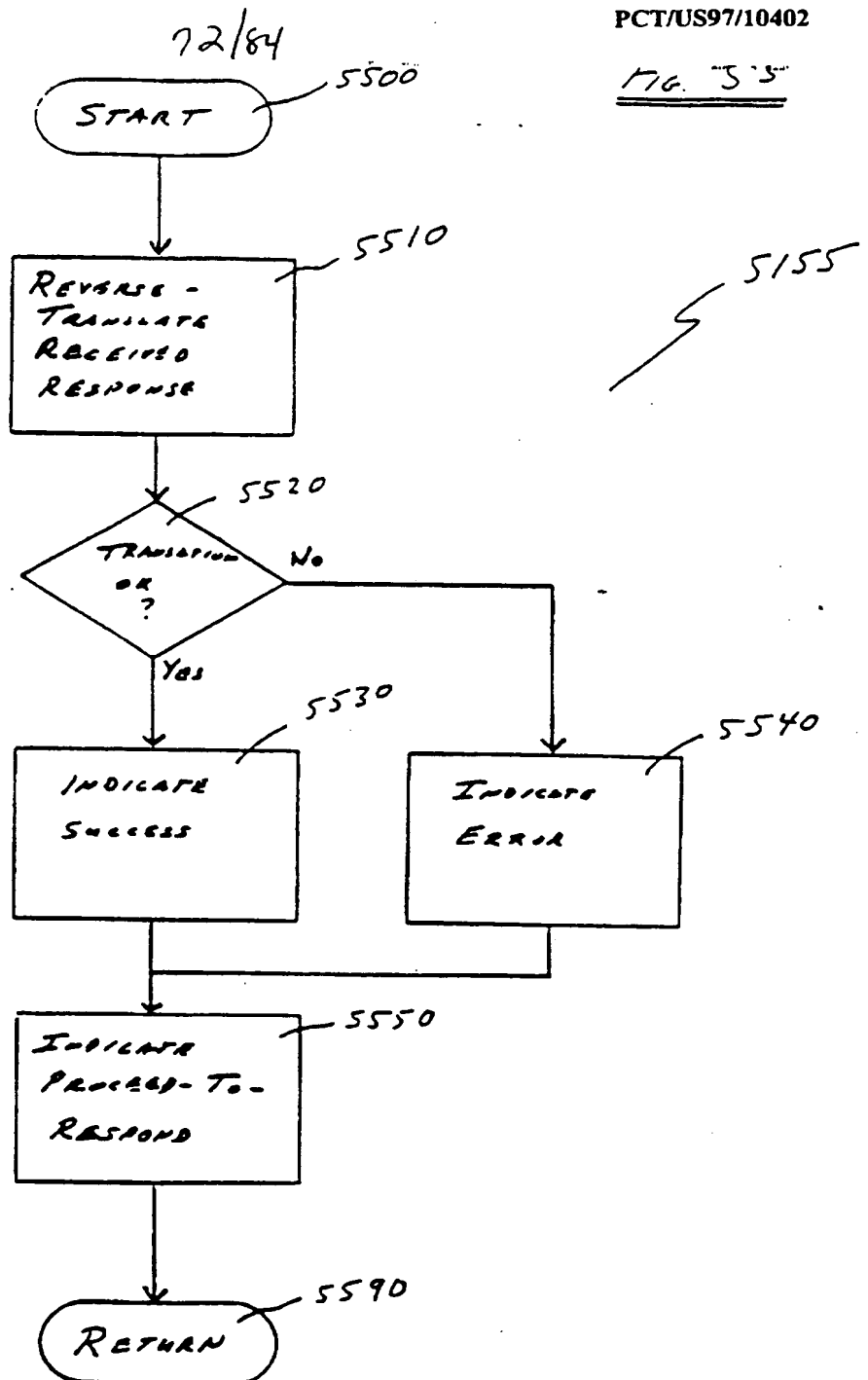
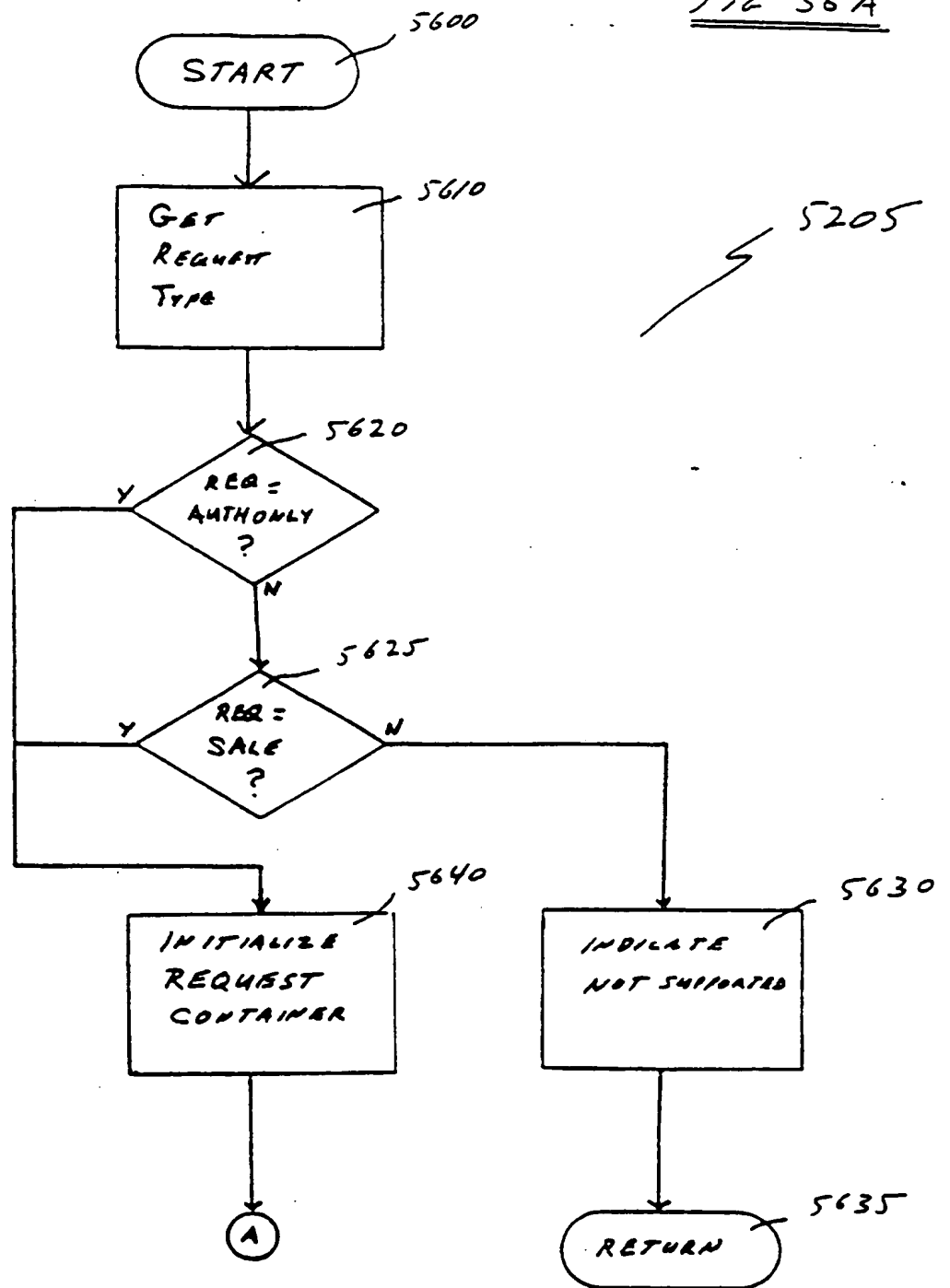
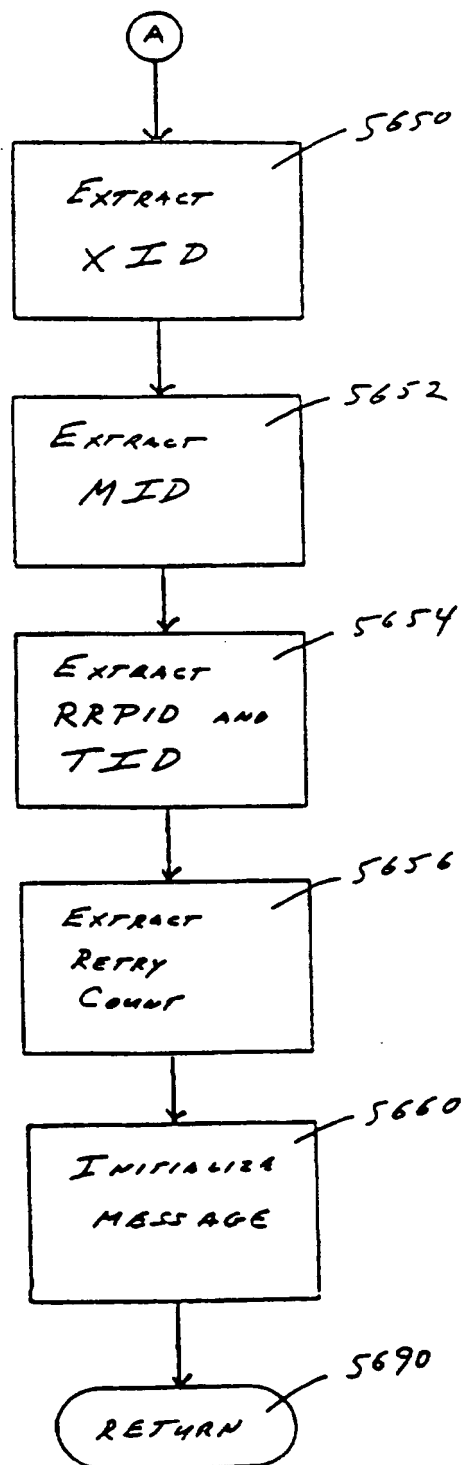
FIG. 54

FIG. 55

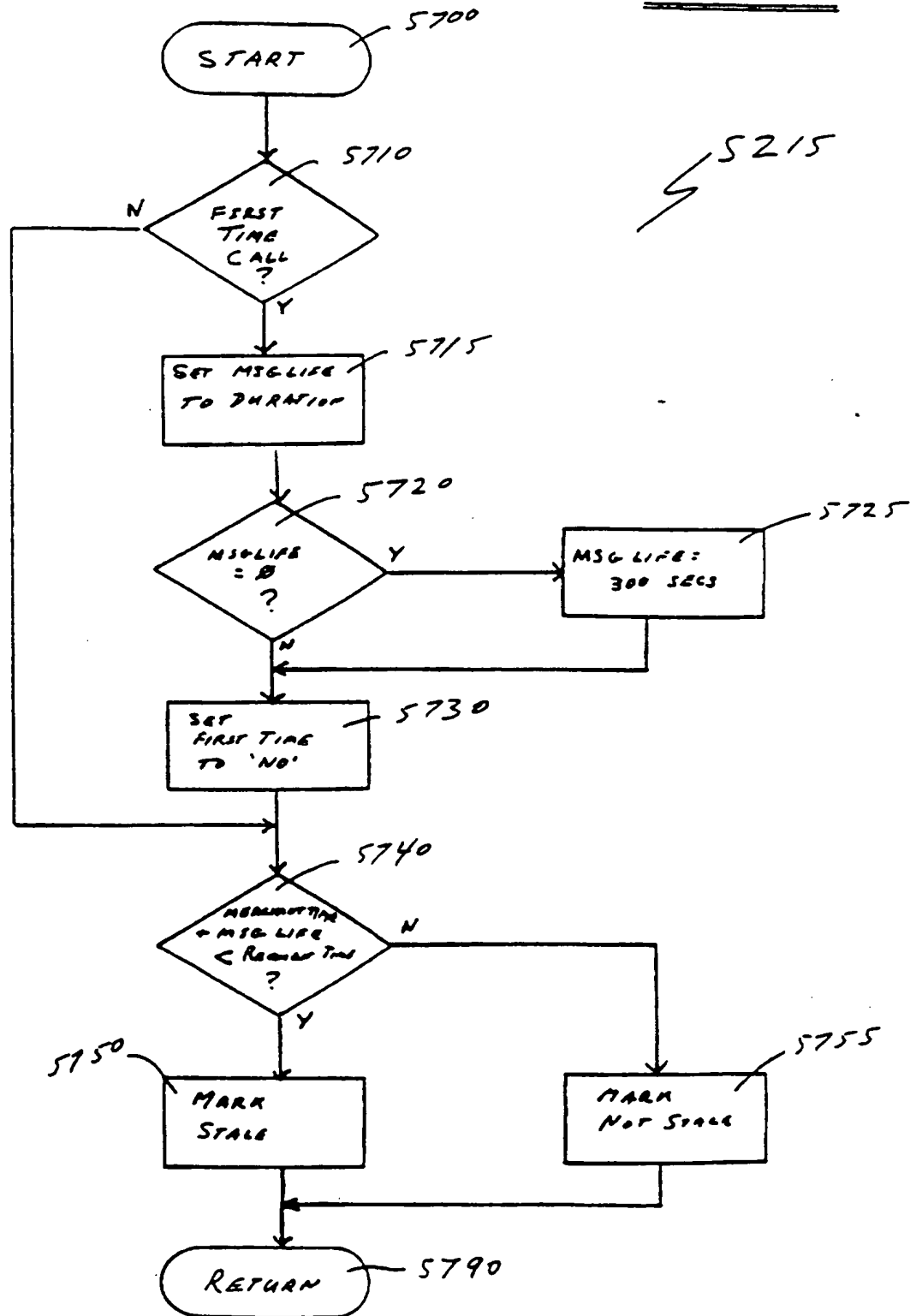
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FIG 56A

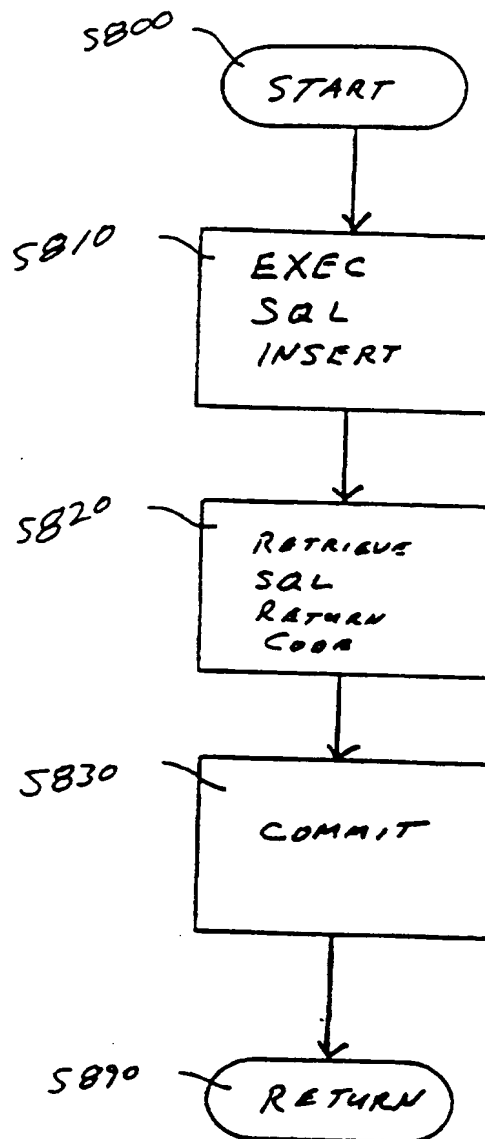
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FIG 56B

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FIG. 57

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FIG. 58

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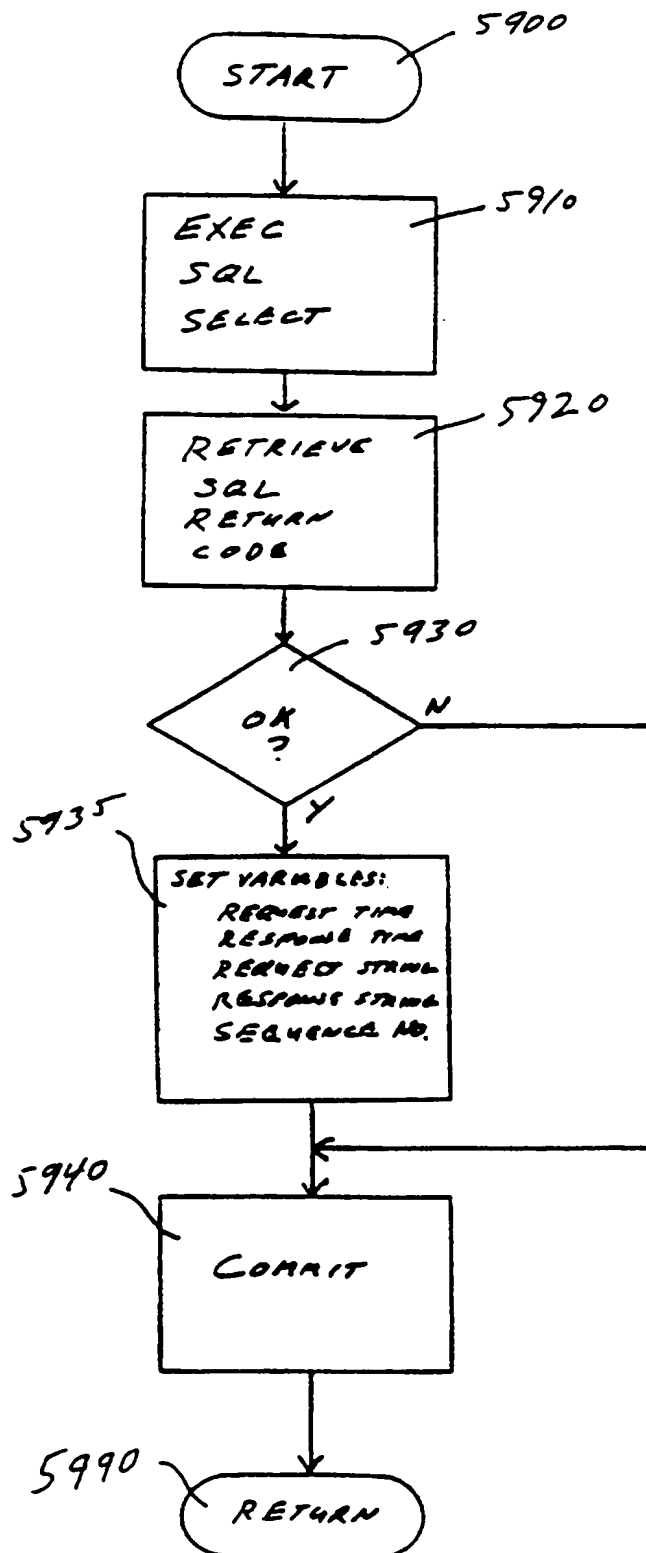
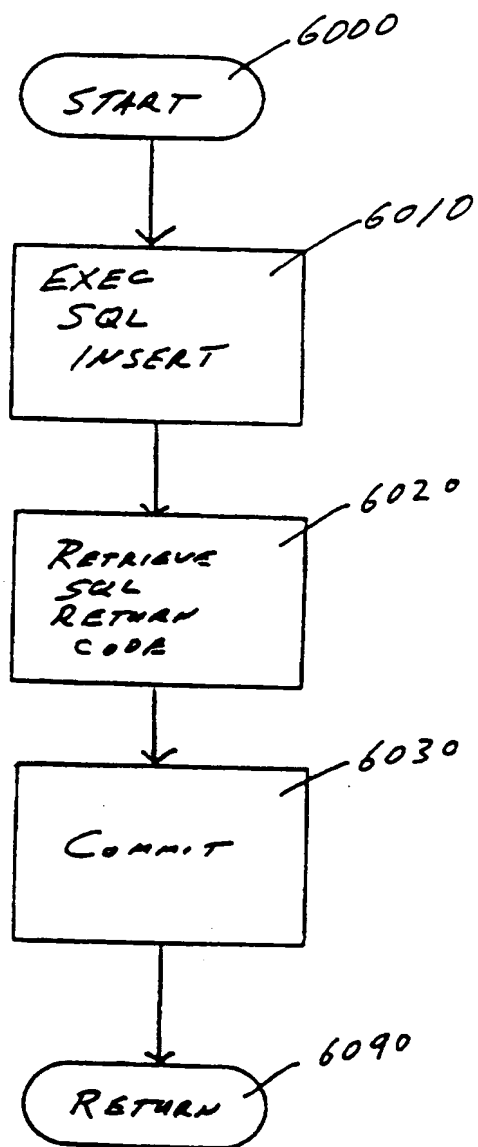
Fig. 59

Fig. 60

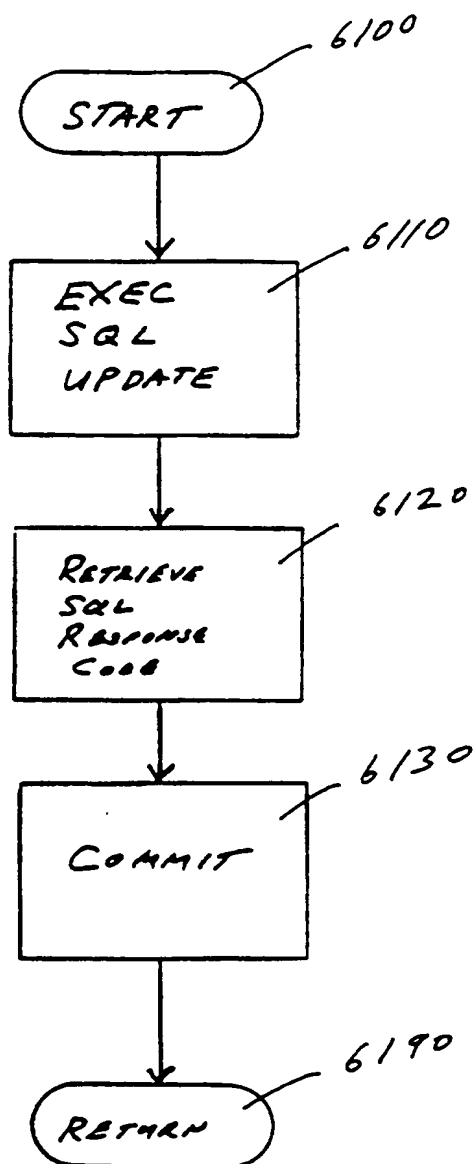
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FIG. 61

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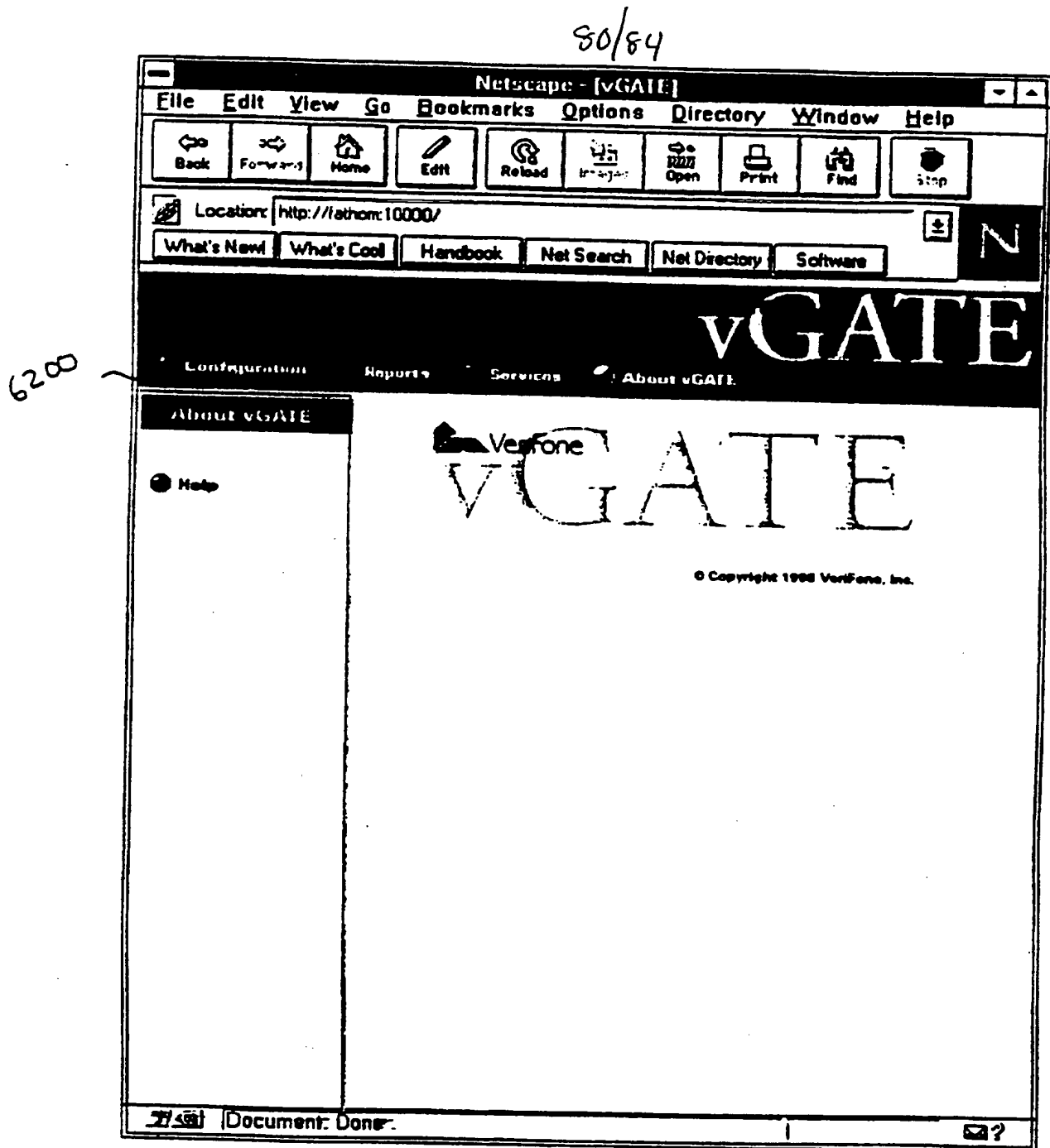


FIGURE 62

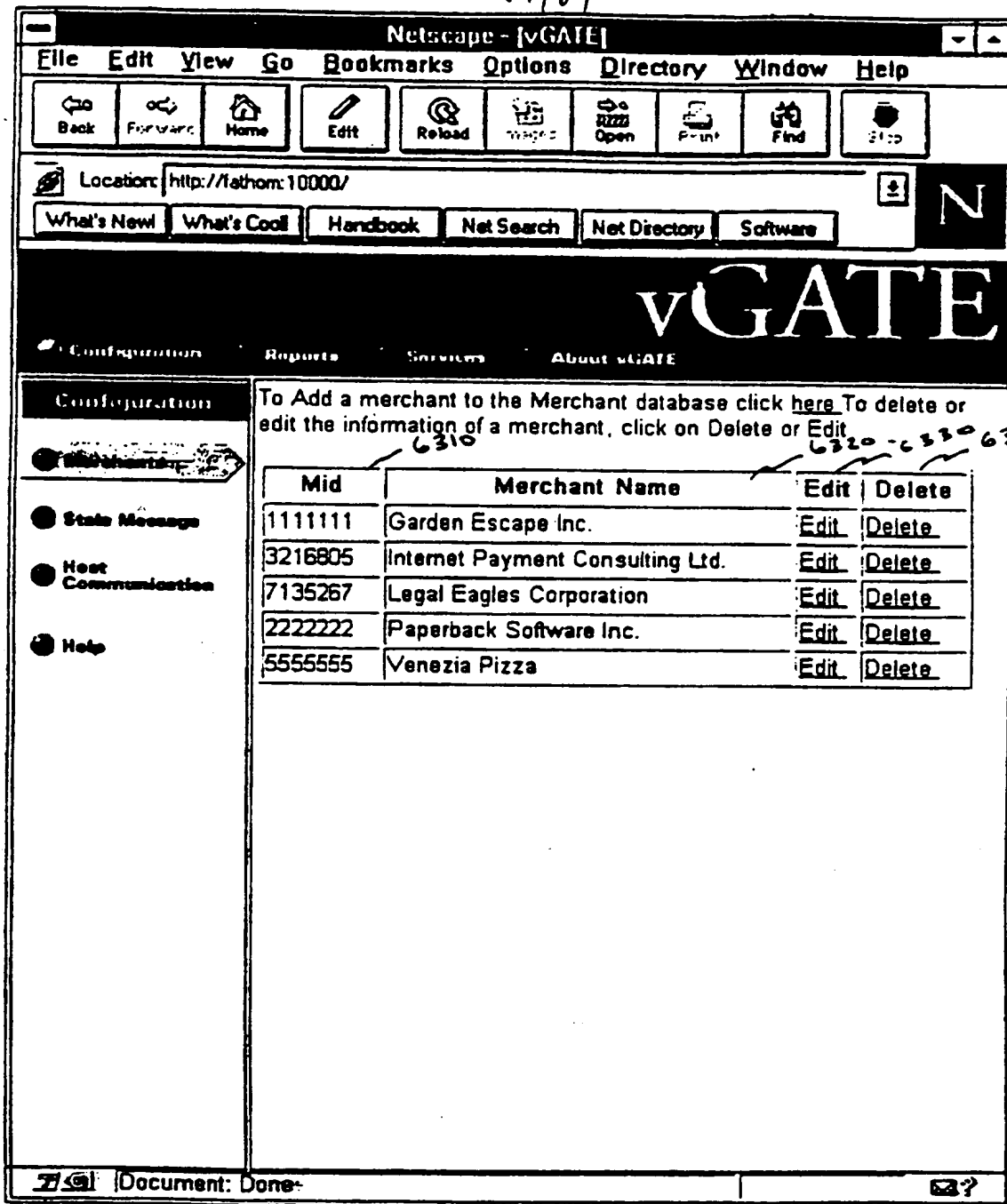


Figure 63

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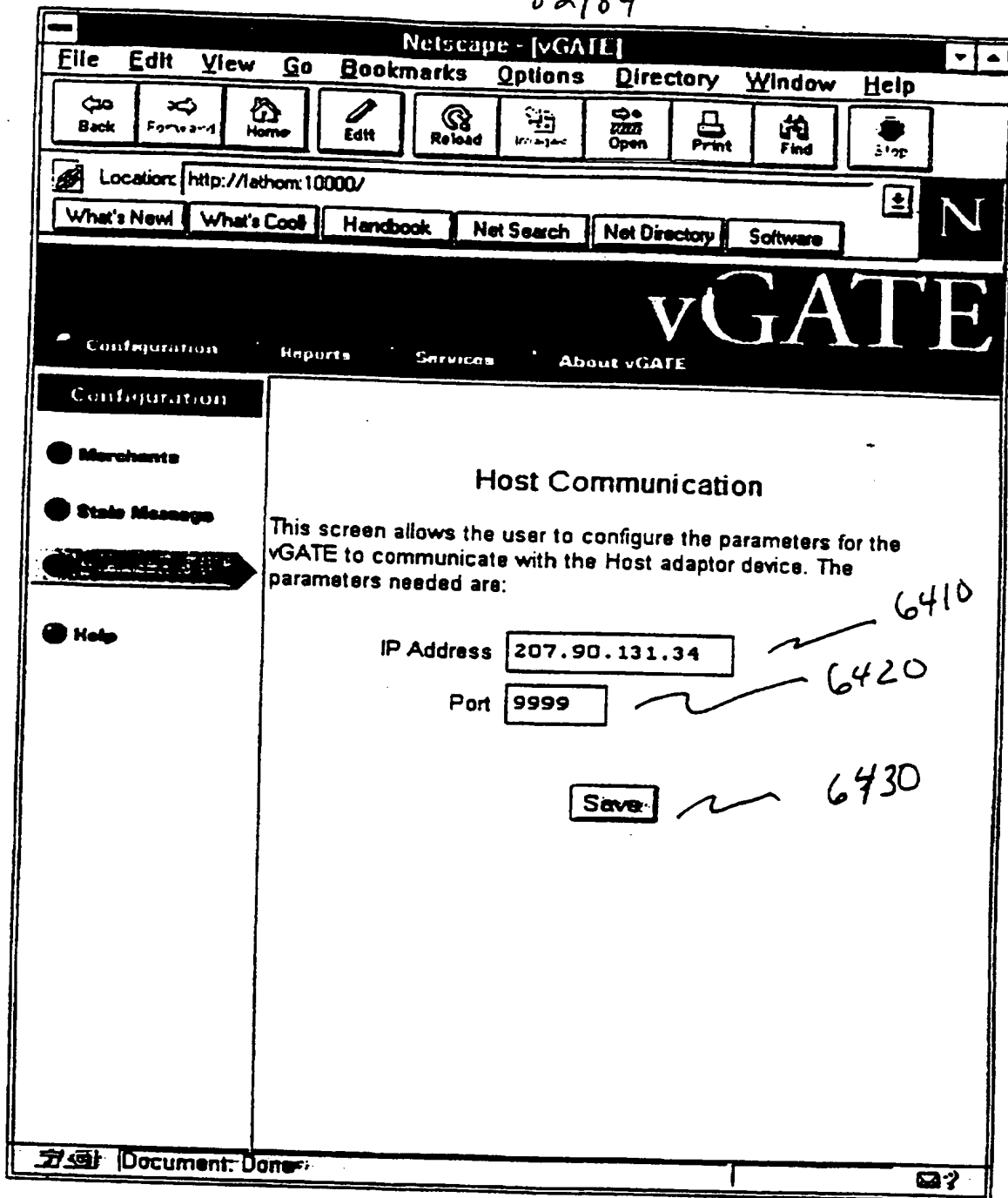


Figure 64

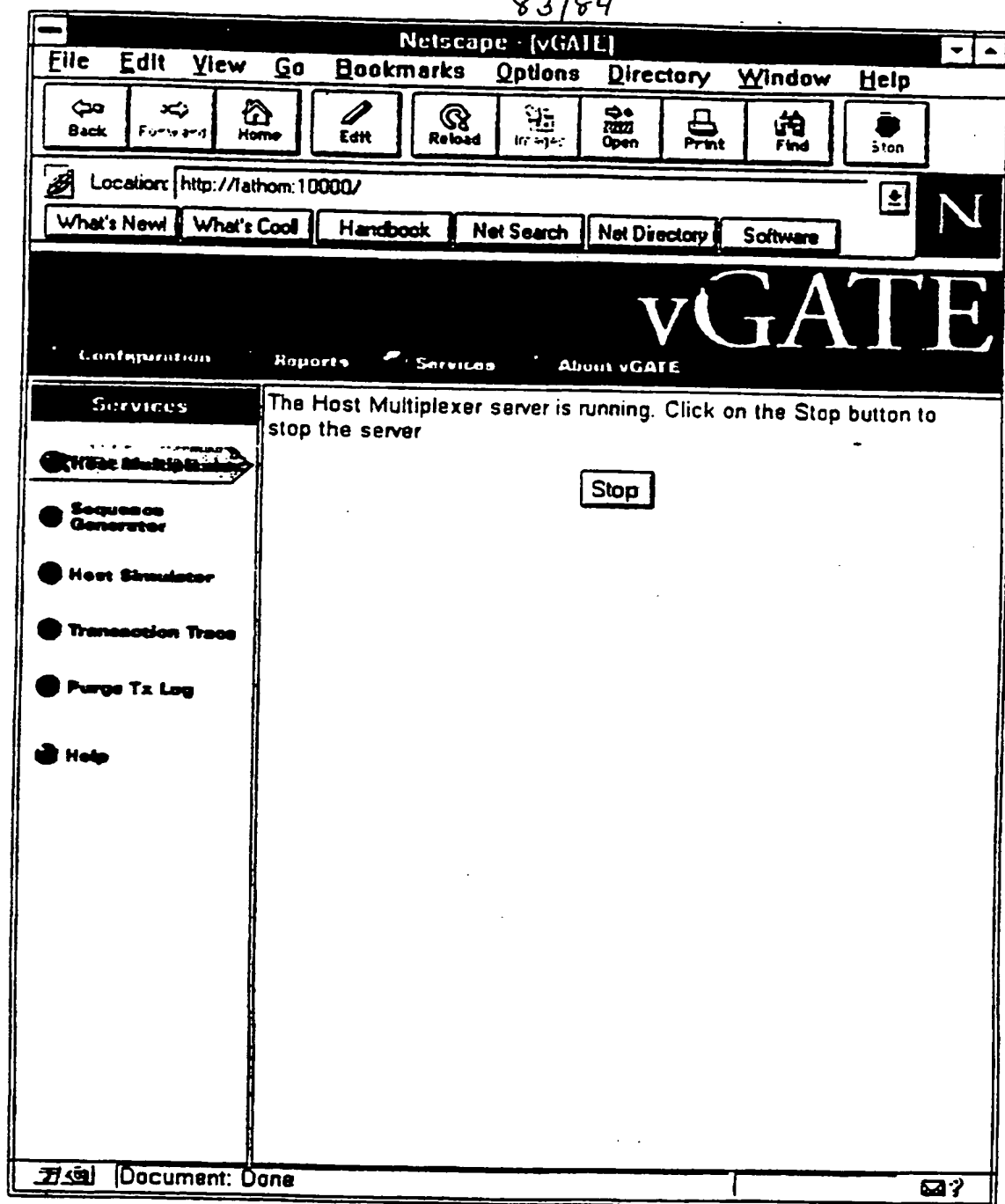


FIGURE 65

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/* Internet Transaction Gateway */
/* Database Schema Design */

-- NOTE: This design does not yet capture the "indexes" that will exist on these tables to aid in
-- query performance. When we have developed the full suite of queries that will use this schema,
-- indexes will be created.

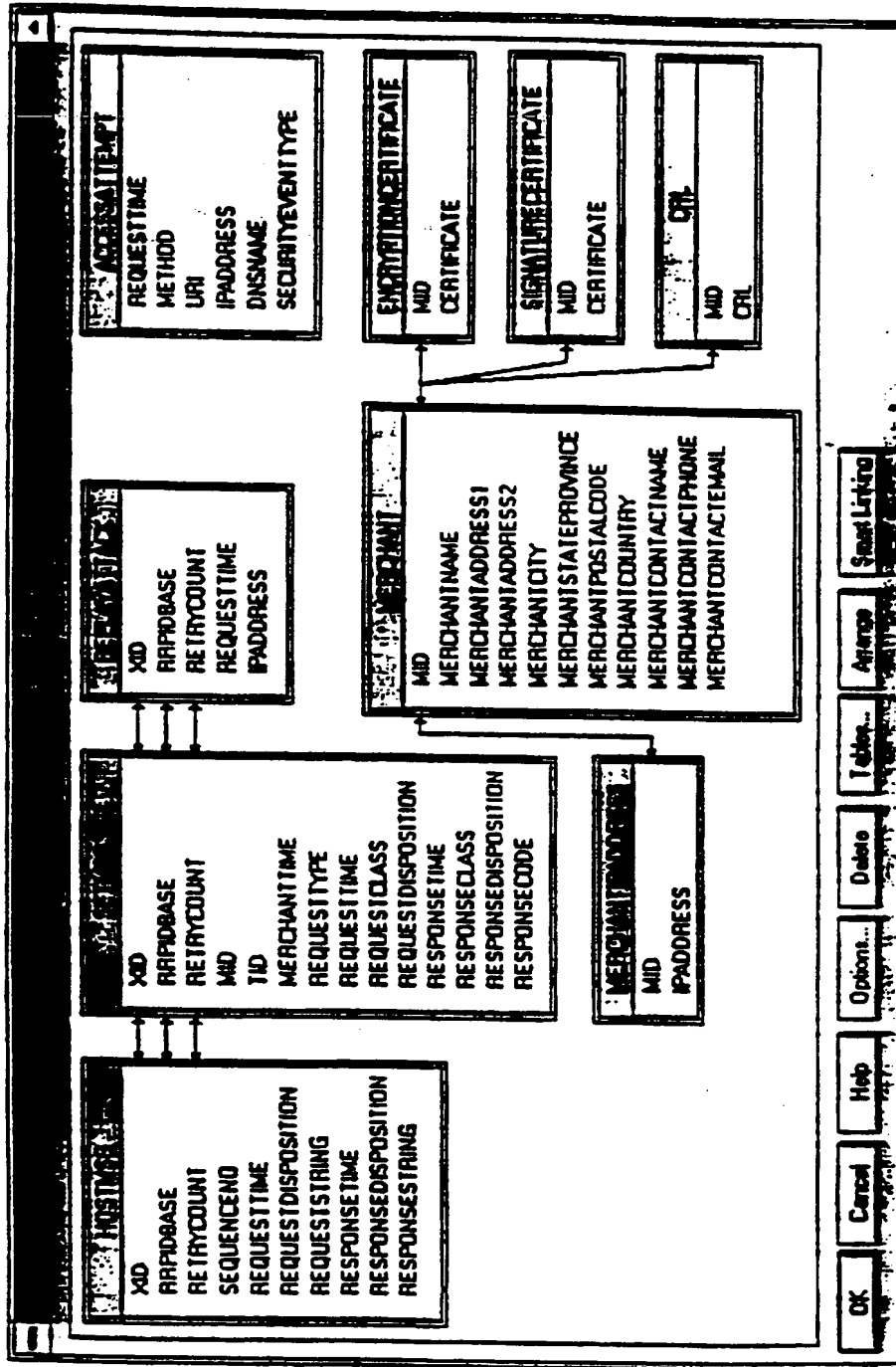


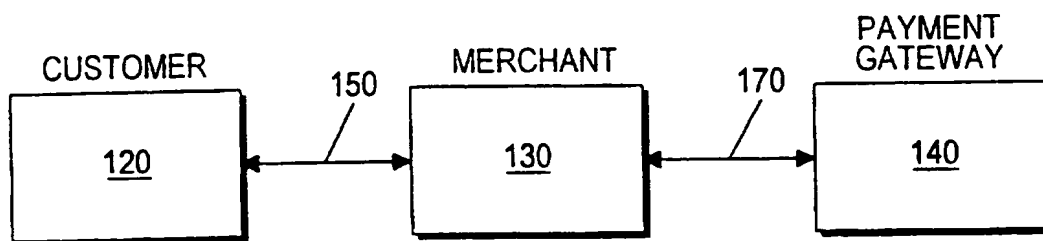
Figure 60



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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			(43) International Publication Date: 24 December 1997 (24.12.97)
(21) International Application Number: PCT/US97/10402		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
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(71) Applicant (for all designated States except US): VERIFONE, INC. [US/US]; Suite 400, Three Lagoon Drive, Redwood City, CA 94065 (US).			
(72) Inventor; and		Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(75) Inventor/Applicant (for US only): BERGER, David, A. [US/US]; 25 McAker Court #136, San Mateo, CA 94403 (US).			
(74) Agents: STEPHENS, L., Keith et al.; Warren, Perez & Stephens, Suite 710, 8411 Preston Road, Dallas, TX 75225 (US).			
(88) Date of publication of the international search report: 19 February 1998 (19.02.98)			

(54) Title: A SYSTEM, METHOD AND ARTICLE OF MANUFACTURE FOR MANAGING TRANSACTIONS IN A HIGH AVAILABILITY SYSTEM



(57) Abstract

An architecture is disclosed allowing a server to communicate bidirectionally with a gateway over a first communication link, over which service requests are initiated by the server. In response to a transaction received from a host legacy system at the gateway, the gateway parses one or more transaction response values from the host message, maps the one or more transaction response values to a canonical response code, and stores the canonical response code in a transaction log. According to a broad aspect of a preferred embodiment of the invention, communication networks that employ transactions between applications must effectively manage transactions that flow over the network. In addition, networking systems must also detect counterfeit transactions, especially, when the networking systems are utilized for financial transactions. An active, on-line database is utilized as a transaction log to track original requests, valid retries and detect fraudulent transactions. The transaction log serves as a memory cache where the received host response is returned to a valid retry transaction should the original response fail to reach a server because of a communications problem.

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INTERNATIONAL SEARCH REPORT

Intern^l Application No
PCT/US 97/10402

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F17/60 G07F19/00 G07F7/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G07F G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 658 862 A (AT & T) 21 June 1995 see the whole document ---	1,2,8, 15,16,22
A	EP 0 501 697 A (AMERICAN TELEPHONE AND TELEGRAPH COMPANY) 2 September 1992 see abstract; claims; figures 3-7 see column 7, line 25 - column 9, line 11 see column 11, line 18 - line 42 ---	1-6, 8-13, 15-20,22
A	WO 96 13013 A (OPEN MARKET) 2 May 1996 see abstract; claims; figures --- -/--	1-3,5,6, 8,15-17, 19,20,22

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Intern. Patent Application No
PCT/US 97/10402

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 440 515 A (VISA) 7 August 1991 see abstract; claims; figures ---	1,2,5,6, 8,15,16, 19,20
A	US 5 018 196 A (K. TAKARAGI) 21 May 1991 -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/10402

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification 6 : G06F 17/60, G07F 19/00, 7/10</p>	A3	<p>(11) International Publication Number: WO 97/49050</p> <p>(43) International Publication Date: 24 December 1997 (24.12.97)</p>
<p>(21) International Application Number: PCT/US97/10402</p> <p>(22) International Filing Date: 17 June 1997 (17.06.97)</p> <p>(30) Priority Data: <div style="display: flex; justify-content: space-between;"> <div>08/664,634</div> <div>17 June 1996 (17.06.96)</div> <div>US</div> </div> <div style="display: flex; justify-content: space-between;"> <div>08/671,822</div> <div>17 June 1996 (17.06.96)</div> <div>US</div> </div> </p> <p>(71) Applicant (for all designated States except US): VERIFONE, INC. [US/US]; Suite 400, Three Lagoon Drive, Redwood City, CA 94065 (US).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): BERGER, David, A. [US/US]; 25 McAker Court #136, San Mateo, CA 94403 (US).</p> <p>(74) Agents: STEPHENS, L., Keith et al.; Warren, Perez & Stephens, Suite 710, 8411 Preston Road, Dallas, TX 75225 (US).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p> <p>(88) Date of publication of the international search report: 19 February 1998 (19.02.98)</p>
<p>(54) Title: A SYSTEM, METHOD AND ARTICLE OF MANUFACTURE FOR MANAGING TRANSACTIONS IN A HIGH AVAILABILITY SYSTEM</p> <div style="text-align: center; margin-top: 20px;"> <pre> graph LR C[CUSTOMER 120] <--> 150 M[MERCHANT 130] M <--> 170 P[PAYMENT GATEWAY 140] </pre> </div>		
<p>(57) Abstract</p> <p>An architecture is disclosed allowing a server to communicate bidirectionally with a gateway over a first communication link, over which service requests are initiated by the server. In response to a transaction received from a host legacy system at the gateway, the gateway parses one or more transaction response values from the host message, maps the one or more transaction response values to a canonical response code, and stores the canonical response code in a transaction log. According to a broad aspect of a preferred embodiment of the invention, communication networks that employ transactions between applications must effectively manage transactions that flow over the network. In addition, networking systems must also detect counterfeit transactions, especially, when the networking systems are utilized for financial transactions. An active, on-line database is utilized as a transaction log to track original requests, valid retries and detect fraudulent transactions. The transaction log serves as a memory cache where the received host response is returned to a valid retry transaction should the original response fail to reach a server because of a communications problem.</p>		

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**A SYSTEM, METHOD AND ARTICLE OF MANUFACTURE
FOR MANAGING TRANSACTIONS IN A HIGH AVAILABILITY SYSTEM**

Field Of The Invention

5 The present invention relates to the secure, electronic payment in exchange for goods and services purchased over a communication network, and more specifically, to a system, method and article of manufacture for securely transmitting payment information from a customer to a merchant to a payment gateway and returning a certification, including a credit confidence factor to allow a merchant to determine
10 whether to accept or reject payment information utilizing a flexible, extensible architecture.

The present invention relates to an electronic graphical representation of a monetary system for implementing electronic money payments as an alternative medium of
15 economic exchange to cash, checks, credit and debit cards, and electronic funds transfer. The Electronic-Monetary System is a hybrid of currency, check, card payment systems, and electronic funds transfer systems, possessing many of the benefits of these systems with few of their limitations. The system utilizes electronic representations of money which are designed to be universally accepted and
20 exchanged as economic value by subscribers of the monetary system.

Today, approximately 350 billion coin and currency transactions occur between individuals and institutions every year. The extensive use of coin and currency transactions has limited the automation of individual transactions such as
25 purchases, fares, and bank account deposits and withdrawals. Individual cash transactions are burdened by the need to have the correct amount of cash or providing change therefor. Furthermore, the handling and managing of paper cash and coins is inconvenient, costly and time consuming for both individuals and financial institutions.

30 Although checks may be written for any specific amount up to the amount available in the account, checks have very limited transferability and must be supplied from a physical inventory. Paper-based checking systems do not offer sufficient relief from the limitations of cash transactions, sharing many of the inconveniences of handling
35 currency while adding the inherent delays associated with processing checks. To this

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end, economic exchange has striven for greater convenience at a lower cost, while also seeking improved security.

Automation has achieved some of these qualities for large transactions through computerized electronic funds transfer ("EFT") systems. Electronic funds transfer is essentially a process of value exchange achieved through the banking system's centralized computer transactions. EFT services are a transfer of payments utilizing electronic "checks," which are used primarily by large commercial organizations.

10 The Clearing House (ACH) where a user can enter a pre-authorized code and download information with billing occurring later, and a Point Of Sale (POS) system where a transaction is processed by connecting with a central computer for authorization for the transaction granted or denied immediately are examples of EFT systems that are utilized by retail and commercial organizations. However, the payments made through these types of EFT systems are limited in that they cannot be performed without the banking system. Moreover, ACH transactions usually cannot be performed during off business hours.

Home Banking bill payment services are examples of an EFT system used by individuals to make payments from a home computer. Currently, home banking initiatives have found few customers. Of the banks that have offered services for payments, account transfers and information over the telephone lines using personal computers, less than one percent of the bank's customers are using the service. One reason that Home Banking has not been a successful product is because the customer cannot deposit and withdraw money as needed in this type of system.

Current EFT systems, credit cards, or debit cards, which are used in conjunction with an on-line system to transfer money between accounts, such as between the account of a merchant and that of a customer, cannot satisfy the need for an automated transaction system providing an ergonomic interface. Examples of EFT systems which provide non-ergonomic interfaces are disclosed in US Patents Numbers 5,476,259; 5,459,304; 5,452,352; 5,448,045; 5,478,993; 5,455,407; 5,453,601; 5,465,291; and 5,485,510.

To implement an automated, convenient transaction that can dispense some form of economic value, there has been a trend towards off-line payments. For example,

numerous ideas have been proposed for some form of "electronic money" that can be used in cashless payment transactions as alternatives to the traditional currency and check types of payment systems. See U.S. Pat. No. 4,977,595, entitled "METHOD AND APPARATUS FOR IMPLEMENTING ELECTRONIC CASH," and U.S. Pat. No. 4,305,059, entitled "MODULAR FUNDS TRANSFER SYSTEM."

5 The more well known techniques include magnetic stripe cards purchased for a given amount and from which a prepaid value can be deducted for specific purposes. Upon exhaustion of the economic value, the cards are thrown away. Other examples include memory cards or so called smart cards which are capable of repetitively

10 storing information representing value that is likewise deducted for specific purposes.

It is desirable for a computer operated under the control of a merchant to obtain information offered by a customer and transmitted by a computer operating under

15 the control of the customer over a publicly accessible packet-switched network (e.g., the Internet) to the computer operating under the control of the merchant, without risking the exposure of the information to interception by third parties that have access to the network, and to assure that the information is from an authentic source. It is further desirable for the merchant to transmit information, including a

20 subset of the information provided by the customer, over such a network to a payment gateway computer system that is designated, by a bank or other financial institution that has the responsibility of providing payment on behalf of the customer, to authorize a commercial transaction on behalf of such a financial institution, without the risk of exposing that information to interception by third

25 parties. Such institutions include, for example, financial institutions offering credit or debit card services.

One such attempt to provide such a secure transmission channel is a secure payment technology such as Secure Electronic Transaction (hereinafter "SET"),

30 jointly developed by the Visa and MasterCard card associations, and described in Visa and MasterCard's *Secure Electronic Transaction (SET) Specification*, February 23, 1996, hereby incorporated by reference. Other such secure payment technologies include Secure Transaction Technology ("STT"), Secure Electronic Payments Protocol ("SEPP"), Internet Keyed Payments ("iKP"), Net Trust, and Cybercash Credit Payment

35 Protocol. One of ordinary skill in the art readily comprehends that any of the secure payment technologies can be substituted for the SET protocol without undue experimentation. Such secure payment technologies require the customer to operate

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software that is compliant with the secure payment technology, interacting with third-party certification authorities, thereby allowing the customer to transmit encoded information to a merchant, some of which may be decoded by the merchant, and some which can be decoded only by a payment gateway specified by the customer.

Another such attempt to provide such a secure transmission channel is a general-purpose secure communication protocol such as Netscape, Inc.'s Secure Sockets Layer (hereinafter "SSL") , as described in Freier, Karlton & Kocher (hereinafter "Freier"), *The SSL Protocol Version 3.0*, March 1996, and hereby incorporated by reference. SSL provides a means for secure transmission between two computers. SSL has the advantage that it does not require special-purpose software to be installed on the customer's computer because it is already incorporated into widely available software that many people utilize as their standard Internet access medium, and does not require that the customer interact with any third-party certification authority. Instead, the support for SSL may be incorporated into software already in use by the customer, e.g., the Netscape Navigator World Wide Web browsing tool. However, although a computer on an SSL connection may initiate a second SSL connection to another computer, a drawback to the SSL approach is each SSL connection supports only a two-computer connection. Therefore, SSL does not provide a mechanism for transmitting encoded information to a merchant for retransmission to a payment gateway such that a subset of the information is readable to the payment gateway but not to the merchant. Although SSL allows for robustly secure two-party data transmission, it does not meet the ultimate need of the electronic commerce market for robustly secure three-party data transmission. Other examples of general-purpose secure communication protocols include Private Communications Technology ("PCT") from Microsoft, Inc., Secure Hyper-Text Transport Protocol ("SHTTP") from Terisa Systems, Shen, Kerberos, Photuris, Pretty Good Privacy ("PGP") which meets the IPSEC criteria. One of ordinary skill in the art readily comprehends that any of the general-purpose secure communication protocols can be substituted for the SSL transmission protocol without undue experimentation.

Banks desire an Internet payment solution that emulates existing Point of Sale (POS) applications that are currently installed on their host computers, and require minimal changes to their host systems. This is a critical requirement since any downtime for a banks host computer system represents an enormous expense.

Currently, VeriFone supports over fourteen hundred different payment-related applications. The large number of applications is necessary to accommodate a wide variety of host message formats, diverse methods for communicating to a variety of hosts with different dial-up and direct-connect schemes, and different certification
5 around the world. In addition, there are a wide variety of business processes that dictate how a Point of Sale (POS) terminal queries a user for data and subsequently displays the data. Also, various vertical market segments, such as hotels, car rental agencies, restaurants, retail sales, mail sales / telephone sales require interfaces for different types of data to be entered, and provide different discount rates to
10 merchants for complying with various data types. Moreover, a plethora of report generation mechanisms and formats are utilized by merchants that banking organizations work with.

Banks are unwilling to converge on "standards" since convergence would facilitate
15 switching from one acquiring bank to another by merchants. In general, banks desire to increase the cost that a merchant incurs in switching from one acquiring bank to another acquiring bank. This is accomplished by supplying a merchant with a terminal that only communicates utilizing the bank's proprietary protocol, and by providing other value-added services that a merchant may not be able to
20 obtain at another bank.

Internet-based payment solutions require additional security measures that are not found in conventional POS terminals. This additional requirement is necessitated because Internet communication is done over publicly-accessible, unsecured
25 communication line in stark contrast to the private, secure, dedicated phone or leased line service utilized between a traditional merchant and an acquiring bank. Thus, it is critical that any solution utilizing the Internet for a communication backbone, employ some form of cryptography.

30 As discussed above, the current state-of-the-art in Internet based payment processing is a protocol referred to as SET. Since the SET messages are uniform across all implementations, banks cannot differentiate themselves in any reasonable way. Also, since SET is not a proper superset of all protocols utilized today, there are bank protocols which cannot be mapped or translated into SET because they
35 require data elements for which SET has no placeholder. Further, SET only handles the message types directly related to authorizing and capturing credit card transactions and adjustments to these authorizations or captures. In a typical POS

-6-

terminal in the physical world, these messages comprise almost the entire volume of the total number of messages between the merchant and the authorizing bank, but only half of the total number of different message types. These message types, which are used infrequently, but which are critical to the operation of the POS terminal must be supported for proper transaction processing.

SUMMARY OF THE INVENTION

According to a broad aspect of a preferred embodiment of the invention, communication networks that employ transactions between applications must effectively manage transactions that flow over the network. In addition, networking systems must also detect counterfeit transactions, especially, when the networking systems are utilized for financial transactions. An active, on-line database is utilized as a transaction log to track original requests, valid retries and detect fraudulent transactions. The transaction log serves as a memory cache where the received host response is returned to a valid retry transaction should the original response fail to reach a server because of a communications problem.

DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages are better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

- 5 **Figure 1A** is a block diagram of a representative hardware environment in accordance with a preferred embodiment;
 Figure 1B depicts an overview in accordance with a preferred embodiment;
 Figure 1C is a block diagram of the system in accordance with a preferred embodiment;
- 10 **Figure 2** depicts a more detailed view of a customer computer system in communication with merchant system under the Secure Sockets Layer protocol in accordance with a preferred embodiment;
 Figure 3 depicts an overview of the method of securely supplying payment information to a payment gateway in order to obtain payment authorization in
15 accordance with a preferred embodiment;
 Figure 4 depicts the detailed steps of generating and transmitting a payment authorization request in accordance with a preferred embodiment;
 Figures 5A through 5F depict views of the payment authorization request and its component parts in accordance with a preferred embodiment;
- 20 **Figures 6A and 6B** depict the detailed steps of processing a payment authorization request and generating and transmitting a payment authorization request response in accordance with a preferred embodiment;
 Figures 7A through 7J depict views of the payment authorization response and its component parts in accordance with a preferred embodiment;
- 25 **Figure 8** depicts the detailed steps of processing a payment authorization response in accordance with a preferred embodiment;
 Figure 9 depicts an overview of the method of securely supplying payment capture information to a payment gateway in accordance with a preferred embodiment;
 Figure 10 depicts the detailed steps of generating and transmitting a payment
30 capture request in accordance with a preferred embodiment;
 Figures 11A through 11F depict views of the payment capture request and its component parts in accordance with a preferred embodiment;
 Figures 12A and 12B depict the detailed steps of processing a payment capture request and generating and transmitting a payment capture request response in
35 accordance with a preferred embodiment;
 Figures 13A through 13F depict views of the payment capture response and its component parts in accordance with a preferred embodiment;

- Figure 14 depicts the detailed steps of processing a payment capture response in accordance with a preferred embodiment;
- Figure 15A & 15B depicts transaction processing of merchant and consumer transactions in accordance with a preferred embodiment;
- 5 Figure 16 illustrates a transaction class hierarchy block diagram in accordance with a preferred embodiment;
- Figure 17 shows a typical message flow between the merchant, vPOS terminal and the Gateway in accordance with a preferred embodiment;
- Figures 18A-E are block diagrams of the extended SET architecture in accordance with a preferred embodiment;
- 10 Figure 19 is a flowchart of vPOS merchant pay customization in accordance with a preferred embodiment;
- Figures 20A-20H are block diagrams and flowcharts setting forth the detailed logic of thread processing in accordance with a preferred embodiment;
- 15 Figure 21 is a detailed diagram of a multithreaded gateway engine in accordance with a preferred embodiment;
- Figure 22 is a flow diagram in accordance with a preferred embodiment;
- Figure 23 illustrates a Gateway's role in a network in accordance with a preferred embodiment;
- 20 Figure 24 is a block diagram of the Gateway in accordance with a preferred embodiment;
- Figure 25 is a block diagram of the vPOS Terminal Architecture in accordance with a preferred embodiment;
- Figure 26 is an architecture block diagram in accordance with a preferred embodiment;
- 25 Figure 27 is a block diagram of the payment manager architecture in accordance with a preferred embodiment;
- Figure 28 is a Consumer Payment Message Sequence Diagram in accordance with a preferred embodiment of the invention;
- 30 Figure 29 is an illustration of a certificate issuance form in accordance with a preferred embodiment;
- Figure 30 illustrates a certificate issuance response in accordance with a preferred embodiment;
- Figure 31 illustrates a collection of payment instrument holders in accordance with a preferred embodiment;
- 35 Figure 32 illustrates the default payment instrument bitmap in accordance with a preferred embodiment;

- Figure 33 illustrates a selected payment instrument with a fill in the blanks for the cardholder in accordance with a preferred embodiment;
- Figure 34 illustrates a coffee purchase utilizing the newly defined VISA card in accordance with a preferred embodiment of the invention;
- 5 Figure 35 is a flowchart of conditional authorization of payment in accordance with a preferred embodiment;
- Figures 36-48 are screen displays in accordance with a preferred embodiment;
- Figure 49 shows how the vPOS authenticates an incoming response to a request in accordance with a preferred embodiment;
- 10 Figure 50 is a flowchart for the merchant interaction with the Test Gateway in accordance with a preferred embodiment;
- Figures 51-61 are flowcharts depicting the detailed logic of the gateway in accordance with a preferred embodiment;
- Figure 62 is the main administration display for the Gateway in accordance with a preferred embodiment;
- 15 Figure 63 is a configuration panel in accordance with a preferred embodiment.
- Figure 64 is a host communication display for facilitating communication between the gateway and the acquirer payment host in accordance with a preferred embodiment;
- 20 Figure 65 is a Services display in accordance with a preferred embodiment; and
- Figure 66 is a graphical representation of the gateway transaction database in accordance with a preferred embodiment.

DETAILED DESCRIPTION

- 25 A preferred embodiment of a system in accordance with the present invention is preferably practiced in the context of a personal computer such as the IBM PS/2, Apple Macintosh computer or UNIX based workstation. A representative hardware environment is depicted in Figure 1A, which illustrates a typical hardware configuration of a workstation in accordance with a preferred embodiment having a
- 30 central processing unit 10, such as a microprocessor, and a number of other units interconnected via a system bus 12. The workstation shown in Figure 1A includes a Random Access Memory (RAM) 14, Read Only Memory (ROM) 16, an I/O adapter 18 for connecting peripheral devices such as disk storage units 20 to the bus 12, a user interface adapter 22 for connecting a keyboard 24, a mouse 26, a speaker 28, a
- 35 microphone 32, and/or other user interface devices such as a touch screen (not shown) to the bus 12, communication adapter 34 for connecting the workstation to a communication network (e.g., a data processing network) and a display adapter 36

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for connecting the bus 12 to a display device 38. The workstation typically has resident thereon an operating system such as the Microsoft Windows NT or Windows/95 Operating System (OS), the IBM OS/2 operating system, the MAC OS, or UNIX operating system. Those skilled in the art will appreciate that the present invention may also be implemented on platforms and operating systems other than those mentioned.

A preferred embodiment is written using JAVA, C, and the C++ language and utilizes object oriented programming methodology. Object oriented programming (OOP) has become increasingly used to develop complex applications. As OOP moves toward the mainstream of software design and development, various software solutions require adaptation to make use of the benefits of OOP. A need exists for these principles of OOP to be applied to a messaging interface of an electronic messaging system such that a set of OOP classes and objects for the messaging interface can be provided.

Thus, as object-oriented programming solutions are applied to various problems and programming tasks, significant reductions in the design and development effort for software can be achieved. A preferred embodiment of the invention utilizes HyperText Markup Language (HTML) to implement documents on the Internet together with a general-purpose secure communication protocol for a transport medium between the client and the merchant. HTTP or other protocols could be readily substituted for HTML without undue experimentation. Information on these products is available in T. Berners-Lee, D. Connolly, "RFC 1866: Hypertext Markup Language - 2.0" (Nov. 1995); and R. Fielding, H. Frystyk, T. Berners-Lee, J. Gettys and J.C. Mogul, "Hypertext Transfer Protocol -- HTTP/1.1: HTTP Working Group Internet Draft" (May 2, 1996). HTML is a simple data format used to create hypertext documents that are portable from one platform to another. HTML documents are SGML documents with generic semantics that are appropriate for representing information from a wide range of domains. HTML has been in use by the World-Wide Web global information initiative since 1990. HTML is an application of ISO Standard 8879:1986 Information Processing Text and Office Systems; Standard Generalized Markup Language (SGML). Sun's JAVA allows developers to create robust User Interface (UI) components. Custom "widgets" (e.g. real-time stock tickers, animated icons, etc.) can be created, and client-side performance is improved. Unlike HTML, Java supports the notion of client-side validation, offloading appropriate processing onto the client for improved performance.

Dynamic, real-time Web pages can be created. Using the above-mentioned custom UI components, dynamic Web pages can also be created.

Sun's Java language has emerged as an industry-recognized language for

5 "programming the Internet." Sun defines Java as: "a simple, object-oriented, distributed, interpreted, robust, secure, architecture-neutral, portable, high-performance, multithreaded, dynamic, buzzword-compliant, general-purpose programming language. Java supports programming for the Internet in the form of platform-independent Java applets." Java applets are small, specialized applications

10 that comply with Sun's Java Application Programming Interface (API) allowing developers to add "interactive content" to Web documents (e.g. simple animations, page adornments, basic games, etc.). Applets execute within a Java-compatible browser (e.g. Netscape Navigator) by copying code from the server to client. From a language standpoint, Java's core feature set is based on C++. Sun's Java literature

15 states that Java is basically "C++, with extensions from Objective C for more dynamic method resolution". Another technology that provides similar function to JAVA is provided by Microsoft and ActiveX Technologies, to give developers and Web designers wherewithal to build dynamic content for the Internet and personal

20 computers. ActiveX includes tools for developing animation, 3-D virtual reality, video and other multimedia content. The tools use Internet standards, work on multiple platforms, and are being supported by over 100 companies. The group's building blocks are called ActiveX Controls, small, fast components that enable developers to embed parts of software in hypertext markup language (HTML) pages. ActiveX

25 Controls work with a variety of programming languages including Microsoft Visual C++, Borland Delphi, Microsoft Visual Basic programming system and, in the future, Microsoft's development tool for Java, code named "Jakarta." ActiveX Technologies also includes ActiveX Server Framework, allowing developers to create server applications. One of ordinary skill in the art readily recognizes that ActiveX could be substituted for JAVA without undue experimentation to practice the invention. Figure

30 **1B** depicts an overview of the present invention. Customer computer system **120** is in communication with merchant computer system **130**. The customer-merchant session **150** operates under a general-purpose secure communication protocol such as the SSL protocol. Merchant computer system **130** is additionally in communication with payment gateway computer system **140**. A payment gateway is

35 a system that provides electronic commerce services in support of a bank or other financial institution, and that interfaces to the financial institution to support the authorization and capture of transactions. The customer-institution session **170**

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operates under a variant of a secure payment technology such as the SET protocol, as described herein, referred to as Merchant-Originated Secure Electronic Transactions ("MOSET"), as is more fully described herein.

5 **Customer-to-Merchant Communication**

Figure 2 depicts a more detailed view of customer computer system 120 in communication with merchant system 130 using customer-merchant session 150 operating under the SSL protocol as documented in Freier and incorporated by reference. Customer computer system 120 initiates communication with merchant
10 computer system 130 using any well-known access protocol, e.g., Transmission Control Protocol/Internet Protocol ("TCP/IP"). A description of TCP/IP is provided in Information Sciences Institute, "Transmission Control Protocol DARPA Internet Program Protocol Specification (RFC 793)" (September, 1981), and Information Sciences Institute, "Internet Protocol DARPA Internet Program Protocol Specification
15 (RFC 791)" (September, 1981). In this implementation, customer computer system 120 acts as a client and merchant computer system 130 acts as a server.

Customer computer system 120 initiates communication by sending "client hello" message 210 to the merchant computer system 130. When a client first connects to
20 a server it is required to send the client hello message 210 as its first message. The client can also send a client hello message 210 in response to a hello request on its own initiative in order to renegotiate the security parameters in an existing connection. The client hello message includes a random structure, which is used later in the protocol. Specifically, the random structure includes the current time
25 and date in standard UNIX 32-bit format according to the sender's internal clock and twenty-eight bytes of data generated by a secure random number generator. The client hello message 210 further includes a variable length session identifier. If not empty, the session identifier value identifies a session between the same client and server whose security parameters the client wishes to reuse. The session
30 identifier may be from an earlier connection, the current connection, or another currently active connection. It is useful to specify the current connection if the client only wishes to update the random structures and derived values of a connection. It is useful to specify another currently active connection if the client wishes to establish several simultaneous independent secure connections to the
35 same server without repeating the full handshake protocol. Client hello message 210 further includes an indicator of the cryptographic algorithms supported by the client in order of the client's preference, ordered according to client preference.

In response to client hello message **210**, if merchant computer system **130** wishes to correspond with customer computer system **120**, it responds with server hello message **215**. If merchant computer system **130** does not wish to communicate with customer computer system **120**, it responds with a message, not shown, indicating refusal to communication. Server hello message **215** includes a random structure, which is used later in the protocol. The random structure in server hello message **215** is in the same format as, but has contents independent of, the random structure in client hello message **210**. Specifically, the random structure includes the current time and date in standard UNIX 32-bit format according to the sender's internal clock and twenty-eight bytes of data generated by a secure random number generator. Server hello message **215** further includes a variable length session identifier. The session identifier value identifies a new or existing session between the same client and server. Server hello message **215** further includes an indicator of the cryptographic algorithms selected from among the algorithms specified by client hello message **210**, which is utilized in further encrypted communications.

Optionally, Merchant computer system **130** transmits a server certificate **220**. If transmitted, server certificate **130** enables customer computer system **120** to authenticate the identity of merchant computer system **130**. If merchant computer system **130** does not transmit a server certificate **220**, or if server certificate **220** is suitable only for authentication, it may optionally transmit a server key exchange message **225**. Server key exchange message **225** identifies a key that may be used by customer computer system **120** to decrypt further messages sent by merchant computer system **130**. After transmitting server hello message **215**, and optionally transmitting server certificate **220** or server key exchange message **225**, merchant computer system **130** transmits a server hello done message **230** and waits for a further response from customer computer system **120**.

Customer computer system **120** optionally transmits client certificate **240** to merchant computer system **130**. If transmitted, client certificate **240** enables merchant computer system **130** to authenticate the identity of customer computer system **120**. Alternatively, customer computer system **120** may transmit a no-client-certificate alert **245**, to indicate that the customer has not registered with any certification authority. If customer computer system **130** does not transmit a client certificate **240**, or if client certificate **240** is suitable only for authentication, customer computer system **130** may optionally transmit a client key exchange

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message **250**. Client key exchange message **250** identifies a key that may be used by merchant computer system **130** to decrypt further messages sent by customer computer system **120**. After optionally transmitting client certificate **240**, no-client-certificate alert **245**, and/or client key exchange message **250**, customer computer
5 system **120** transmits a finished message **260**.

At this point, customer computer system **120** and merchant computer system **130** have:

- 1) negotiated an encryption scheme that may be commonly employed in further
10 communications, and
- 2) have communicated to each other a set of encryption keys that may be used to decrypt further communications between the two computer systems.

Customer computer system **120** and merchant computer system **130** may thereafter
15 engage in secure communications **270** with less risk of interception by third parties. Among the messages communicated by customer computer system **120** to merchant computer system **130** may be messages that specify goods or services to be ordered and payment information, such as a credit card number and related information, collectively referred to as "payment information," that may be used to pay for the
20 goods and/or services ordered. In order to obtain payment, the merchant must supply this information to the bank or other payment gateway responsible for the proffered payment method. This enables the merchant to perform payment authorization and payment capture. Payment authorization is the process by which permission is granted by a payment gateway operating on behalf of a financial
25 institution to authorize payment on behalf of the financial institution. This is a process that assesses transaction risk, confirms that a given transaction does not raise the account holder's debt above the account's credit limit, and reserves the specified amount of credit. Payment capture is the process that triggers the movement of funds from the financial institution to the merchant's account after
30 settlement of the account.

Payment Authorization

Merchants utilize point-of-sale products for credit and debit transactions on a daily basis. An embodiment in accordance with the subject invention allows an acquirer
35 processor to accept transactions from Internet storefronts without altering a current host environment.

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The system easily converts payment protocol messages and simultaneously manages transactions from a number of Internet merchant servers. As the number of transactions grows, the payment gateway can be scaled to handle the increased business, and it can be configured to work with specific business processes used by the acquirer/processor. Thus, the payment gateway supports Internet processing utilizing payment processing operations.

The payment gateway provides support for configuring and installing the Internet payment capability utilizing existing host point-of-sale technology. The payment gateway also provides an intuitive Graphical User Interface (GUI) with support built in to accommodate future payment instruments such as debit cards, electronic checks, electronic cash and micropayments. The payment gateway implements secure transactions using RSA public-key cryptography and the MasterCard/Visa Secure Electronic Transaction (SET) protocol. The gateway also provides full functionality for merchant payment processing including authorization, capture, settlement and reconciliation while providing monitor activity with reporting and tracking of transactions sent over the Internet. Finally, the payment gateway also implements Internet payment procedures that match current processor business models to ensure consistency for merchants. Handling Internet transactions is destined to become a necessary function for every payment processing system. Today, merchants often transmit data received over the Internet inefficiently. Some fax the information or waste time keying data into a non-Internet system.

Figure 3 depicts an overview of the method of securely supplying payment information to a payment gateway in order to obtain payment authorization. In function block 310, merchant computer system 130 generates a payment authorization request 315 and transmits it to payment gateway computer system 140. In function block 330, payment gateway system 140 processes the payment authorization request, generates a payment authorization response 325 and transmits it to merchant computer system 130. In function block 320, merchant computer system 130 processes payment authorization response 325 and determines whether payment for the goods or services sought to be obtained by the customer has been authorized.

Payment Authorization Request Generation

Figure 4 depicts the detailed steps of generating and transmitting a payment authorization request. Figures 5A through 5F depict views of the payment

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authorization request and its component parts. In function block **410**, merchant computer system **130** creates a basic authorization request **510**. The basic authorization request is a data area that includes all the information for determining whether a request should be granted or denied. Specifically, it includes such

5 information as the party who is being charged, the amount to be charged, the account number of the account to be charged, and any additional data, such as passwords, needed to validate the charge. This information is either calculated based upon prior customer merchandise selection, or provided by the customer over the secure link **270** established in the customer-merchant general-purpose secure

10 communication protocol session. Fig **5A** depicts a basic authorization request **510**.

In function block **420**, merchant computer system **130** combines basic authorization request **510**, a copy of its encryption public key certificate **515** and a copy of its signature public key certificate **520**. Merchant computer system **130**

15 calculates a digital signature **525** for the combined contents of the combined block **530** comprising basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**, and appends it to the combination of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. The merchant

20 computer system calculates digital signature **525** by first calculating a "message digest" based upon the contents of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. A message digest is the fixed-length result that is generated when a variable length message is fed into a one-way hashing function. Message digests help verify

25 that a message has not been altered because altering the message would change the digest. The message digest is then encrypted using the merchant computer system's **130** digital signature private key, thus forming a digital signature.

Figure **5B** depicts the combined block **530** formed by function block **420** and

30 containing basic authorization request **510**, the encryption public key certificate **515**, the signature public key certificate **520**, and digital signature **525**. In function block **430**, merchant computer system **130** generates a random encryption key RK-0 **540**, denoted as RK-0. Random encryption key RK-0 **540** is a symmetric encryption key. A symmetric encryption key is a key characterized by the property that a

35 message encrypted with a symmetric key can be decrypted with that same key. This is contrasted with an asymmetric key pair, such as a public-key/private-key key pair, where a message encrypted with one key of the key pair may only be decrypted

with the other key of the same key pair. Figure 5C depicts random encryption key RK-0 540.

5 In function block 440, merchant computer system 130 encrypts combined block 530 using random encryption key RK-0 540 to form encrypted combined block 550. Figure 5D depicts encrypted combined block 550. The encryption state of encrypted combined block 550 is graphically shown by random key lock 555, which indicates that encrypted combined block 550 is encrypted using random key RK-0 540. In function block 450, merchant computer system 130 encrypts random encryption
10 key RK-0 540 using the public key of payment gateway system 140 to form encrypted random key 560. Figure 5E depicts encrypted random key 560. The encryption state of encrypted random key 560 is graphically shown by payment gateway public key lock 565, which indicates that encrypted random key 560 is encrypted using the payment gateway public key. In function block 460, merchant
15 computer system 130 concatenates encrypted combined block 550 and encrypted random key 560 to form merchant authorization request 315. Figure 5F depicts merchant authorization request 315 comprising encrypted combined block 550 and encrypted random key 560. In function block 470, merchant computer system 130 transmits merchant authorization request 315 to payment gateway system 140.

20

Payment Authorization Request Processing

Figure 6 depicts the detailed steps of processing a payment authorization request and generating and transmitting a payment authorization request response. Function blocks 610 through 630 depict the steps of processing a payment
25 authorization request, while function blocks 635 through 685 depict the steps of generating and transmitting a payment authorization request response. In function block 610, payment gateway computer system 140 applies its private key to encrypted random key 560 contained within received merchant authorization request 315, thereby decrypting it and obtaining a cleartext version of random key
30 RK-0 540. In function block 615, payment gateway computer system 140 applies random key RK-0 540 to encrypted combined block 550, thereby decrypting it and obtaining a cleartext version of combined block 530. Combined block 530 comprises basic authorization request 510, a copy of merchant computer system's 130 encryption public key certificate 515 and a copy of merchant computer system's
35 130 signature public key certificate 520, as well as merchant digital signature 525.

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In function block **620**, payment gateway computer system **140** verifies merchant computer system's **130** encryption public key certificate **515** and merchant computer system's **130** signature public key certificate **520**. Payment gateway computer system **140** performs this verification by making a call to the certification authorities associated with each certificate. If verification of either certificate fails, payment gateway computer system **140** rejects the authorization request. In function block **625**, payment gateway computer system **140** validates merchant digital signature **525**. Payment gateway computer system **140** performs this validation by calculating a message digest over the contents of the combined basic authorization request **510**, the encryption public key certificate **515** and the signature public key certificate **520**. Payment gateway computer system **140** then decrypts digital signature **525** to obtain a copy of the equivalent message digest calculated by merchant computer system **130** in function block **420**. If the two message digests are equal, the digital signature **525** is validated. If validation fails, payment gateway computer system **140** rejects the authorization request. In function block **630**, payment gateway computer system **140** determines the financial institution for which authorization is required by inspection of basic authorization request **510**. Payment gateway computer system **140** contacts the appropriate financial institution using a secure means, e.g, a direct-dial modem-to-modem connection, or a proprietary internal network that is not accessible to third parties, and using prior art means, obtains a response indicating whether the requested payment is authorized.

Payment Authorization Response Generation

Function blocks **635** through **685** depict the steps of generating and transmitting a payment authorization request response. Figures **7A** through **7J** depict views of the payment authorization response and its component parts. In function block **635**, payment gateway computer system **140** creates a basic authorization response **710**. The basic authorization request is a data area that includes all the information to determine whether a request was granted or denied. Figure **7A** depicts basic authorization response **710**. In function block **640**, payment gateway computer system **140** combines basic authorization response **710**, and a copy of its signature public key certificate **720**. Payment computer system **140** calculates a digital signature **725** for the combined contents of the combined block **730** comprising basic authorization response **710** and the signature public key certificate **720**, and appends the signature to the combination of the combined basic authorization response **710** and the signature public key certificate **720**. The payment gateway

computer system calculates digital signature **725** by first calculating a message digest based on the contents of the combined basic authorization response **710** and signature public key certificate **720**. The message digest is then encrypted using the merchant computer system's **140** digital signature private key, thus forming a
5 digital signature.

Figure **7B** depicts the combined block **730** formed in function block **640** and containing basic authorization response **710**, the signature public key certificate **720**, and digital signature **725**. In function block **645**, payment gateway computer
10 system **150** generates a first symmetric random encryption key **740**, denoted as RK-1. Figure **7C** depicts first random encryption key RK-1 **740**. In function block **650**, payment gateway computer system **140** encrypts combined block **730** using random encryption key RK-1 **740** to form encrypted combined block **750**. Figure **7D** depicts encrypted combined block **750**. The encryption state of encrypted combined block
15 **750** is graphically shown by random key lock **755**, which indicates that encrypted combined block **750** is encrypted using random key RK-1 **740**. In function block **655**, payment gateway computer system **140** encrypts random encryption key RK-1 **740** using the public key of merchant computer system **130** to form encrypted random key RK **760**. Figure **7E** depicts encrypted random key RK-1 **760**. The
20 encryption state of encrypted random key **760** is graphically shown by merchant public key lock **765**, which indicates that encrypted random key **760** is encrypted using the merchant public key. In function block **660**, payment gateway computer system **140** generates a random capture token **770**. Random capture token **770** is utilized in subsequent payment capture processing to associate the payment capture
25 request with the payment authorization request being processed. Figure **7F** depicts capture token **775**. In function block **665**, payment gateway computer system **140** generates a second symmetric random encryption key **775**, denoted as RK-2. Figure **7G** depicts second random encryption key RK-2 **775**. In function block **670**, payment gateway computer system **140** encrypts capture token **770** using random encryption key RK-2 **770** to form encrypted capture token **780**. Figure **7H** depicts encrypted capture token **780**. The encryption state of encrypted capture token **780** is graphically shown by random key lock **785**, which indicates that encrypted capture token **780** is encrypted using random key RK-2 **770**. In function block **675**, payment gateway computer system **140** encrypts second random encryption key RK-
30 **2 775** using its own public key to form encrypted random key RK-2 **790**. Figure **7I** depicts encrypted random key RK-2 **790**. The encryption state of encrypted random key **790** is graphically shown by payment gateway public key lock **795**, which

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indicates that encrypted random key **790** is encrypted using the payment gateway public key. In function block **680**, payment gateway computer system **140** concatenates encrypted combined block **750**, encrypted random key RK-1 **760**, encrypted capture token **780** and encrypted random key RK-2 **790** to form merchant authorization response **325**. Figure **7J** depicts merchant authorization response **325** comprising encrypted combined block **750**, encrypted random key RK-1 **760**, encrypted capture token **780** and encrypted random key RK-2 **790**. In function block **685**, payment gateway computer system **140** transmits merchant authorization response **325** to merchant system **130**.

Payment Authorization Response Processing

Figure **8** depicts the detailed steps of processing a payment authorization response. In function block **810**, merchant computer system **130** applies its private key to encrypted random key RK-1 **760** contained within received merchant authorization response **325**, thereby decrypting it and obtaining a cleartext version of random key RK-1 **740**. In function block **820**, merchant computer system **130** applies random key RK-1 **740** to encrypted combined block **750**, thereby decrypting it and obtaining a cleartext version of combined block **730**. Combined block **730** comprises basic authorization response **710**, a copy of payment gateway computer system's **140** signature public key certificate **720**, as well as payment gateway digital signature **725**. In function block **830**, merchant computer system **130** verifies payment gateway computer system's **140** signature public key certificate **720**. Merchant computer system **130** performs this verification by making a call to the certification authority associated with the certificate. If verification of the certificate fails, merchant computer system **130** concludes that the authorization response is counterfeit and treats it though the authorization request had been rejected. In function block **840**, merchant computer system **130** validates payment gateway digital signature **725**. Merchant computer system **130** performs this validation by calculating a message digest over the contents of the combined basic authorization request **710** and the signature public key certificate **720**. Merchant computer system **130** then decrypts digital signature **725** to obtain a copy of the equivalent message digest calculated by payment gateway computer system **140** in function block **640**. If the two message digests are equal, the digital signature **725** is validated. If validation fails, concludes that the authorization response is counterfeit and treats it though the authorization request had been rejected. In function block **850**, merchant computer system **130** stores encrypted capture token **780** and encrypted random key RK-2 **790** for later use in payment capture. In function block

860, merchant computer system 130 processes the customer purchase request in accordance with the authorization response 710. If the authorization response indicates that payment is authorized, merchant computer system 130 fills the requested order. If the authorization response indicates that payment is not
5 authorized, or if merchant computer system 130 determined in function block 830 or 840 that the authorization response is counterfeit, merchant computer system 130 indicates to the customer that the order cannot be filled.

Payment Capture

10 Figure 9 depicts an overview of the method of securely supplying payment capture information to payment gateway 140 in order to obtain payment capture. In function block 910, merchant computer system 130 generates a merchant payment capture request 915 and transmits it to payment gateway computer system 140. In function block 930, payment gateway system 140 processes the payment capture
15 request 915, generates a payment capture response 925 and transmits it to merchant computer system 130. In function block 920, merchant computer system 130 processes payment capture response 925 and verifies that payment for the goods or services sought to be obtained by the customer have been captured.

Payment Capture Request Generation

20 Figure 10 depicts the detailed steps of generating and transmitting a payment capture request. Figures 11A through 11F depict views of the payment capture request and its component parts. In function block 1010, merchant computer system 130 creates a basic capture request 510. The basic capture request is a
25 data area that includes all the information needed by payment gateway computer system 140 to trigger a transfer of funds to the merchant operating merchant computer system 130. Specifically, a capture request includes a capture request amount, a capture token, a date, summary information of the purchased items and a Merchant ID (MID) for the particular merchant. Figure 11A depicts basic
30 authorization request 1110. In function block 1020, merchant computer system 130 combines basic capture request 1110, a copy of its encryption public key certificate 1115 and a copy of its signature public key certificate 1120. Merchant computer system 130 calculates a digital signature 1125 for the combined contents of the combined block 1130 comprising basic capture request 1110, the encryption
35 public key certificate 1115 and the signature public key certificate 1120, and appends it to the combination of the combined basic capture request 1110, the encryption public key certificate 1115 and the signature public key certificate 1120.

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The merchant computer system calculates digital signature 1125 by first calculating a message digest over the contents of the combined basic capture request 1110, the encryption public key certificate 1115 and the signature public key certificate 1120. The message digest is then encrypted using the merchant computer system's 130 digital signature private key, thus forming a digital signature.

Figure 11B depicts the combined block 1130 formed by function block 1020 and containing basic capture request 1110, the encryption public key certificate 1115, the signature public key certificate 1120, and digital signature 1125. In function block 1030, merchant computer system 130 generates a random encryption key 1140, denoted as RK-3. Random encryption key RK-3 1140 is a symmetric encryption key. Figure 11C depicts random encryption key RK-3 1140. In function block 1040, merchant computer system 130 encrypts combined block 1130 using random encryption key RK-3 1140 to form encrypted combined block 1150. Figure 11D depicts encrypted combined block 1150. The encryption state of encrypted combined block 1150 is graphically shown by random key lock 1155, which indicates that encrypted combined block 1150 is encrypted using random key RK-3 1140. In function block 1050, merchant computer system 130 encrypts random encryption key RK-3 1140 using the public key of payment gateway system 140 to form encrypted random key 1160. Figure 11E depicts encrypted random key 1160. The encryption state of encrypted random key 1160 is graphically shown by payment gateway public key lock 1165, which indicates that encrypted random key RK-3 1160 is encrypted using the payment gateway public key. In function block 1060, merchant computer system 130 concatenates encrypted combined block 1150, encrypted random key 1160, and the encrypted capture token 780 and encrypted random key RK-2 790 that were stored in function block 850 to form merchant capture request 915. Figure 11F depicts merchant capture request 915, comprising encrypted combined block 1150, encrypted random key 1160, encrypted capture token 780 and encrypted random key RK-2 790. In function block 1070, merchant computer system 130 transmits merchant capture request 915 to payment gateway system 140.

Payment Capture Request Processing

Figure 12 depicts the detailed steps of processing a payment capture request and generating and transmitting a payment capture request response. Function blocks 1210 through 1245 depict the steps of processing a payment capture request, while function blocks 1250 through 1285 depict the steps of generating and transmitting

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a payment capture request response. In function block **1210**, payment gateway computer system **140** applies its private key to encrypted random key **1160** contained within received merchant capture request **915**, thereby decrypting it and obtaining a cleartext version of random key **RK-3 1140**. In function block **1215**,
5 payment gateway computer system **140** applies random key **RK-3 1140** to encrypted combined block **1150**, thereby decrypting it and obtaining a cleartext version of combined block **1130**. Combined block **1130** comprises basic capture request **1110**, a copy of merchant computer system's **130** encryption public key certificate **1115** and a copy of merchant computer system's **130** signature public key
10 certificate **1120**, as well as merchant digital signature **1125**. In function block **1220**, payment gateway computer system **140** verifies merchant computer system's **130** encryption public key certificate **1115** and merchant computer system's **130** signature public key certificate **1120**. Payment gateway computer system **140** performs this verification by making a call to the certification authorities associated
15 with each certificate. If verification of either certificate fails, payment gateway computer system **140** rejects the capture request. In function block **1225**, payment gateway computer system **140** validates merchant digital signature **1125**. Payment gateway computer system **140** performs this validation by calculating a message digest over the contents of the combined basic capture request **1110**, the encryption
20 public key certificate **1115** and the signature public key certificate **1120**. Payment gateway computer system **140** then decrypts digital signature **1125** to obtain a copy of the equivalent message digest calculated by merchant computer system **130** in function block **1020**. If the two message digests are equal, the digital signature **1125** is validated. If validation fails, payment gateway computer system **140** rejects
25 the capture request. In function block **1230**, payment gateway computer system **140** applies its private key to encrypted random key **RK-2 790** contained within received merchant capture request **915**, thereby decrypting it and obtaining a cleartext version of random key **RK-2 775**. In function block **1235**, payment gateway computer system **140** applies random key **RK-2 775** to encrypted capture
30 token **780**, thereby decrypting it and obtaining a cleartext version of capture token **770**. In function block **1240**, payment gateway computer system **140** verifies that a proper transaction is being transmitted between capture token **780** and capture request **1110**. A capture token contains data that the gateway generates at the time of authorization. When the authorization is approved, the encrypted capture token
35 is given to the merchant for storage. At the time of capture, the merchant returns the capture token to the gateway along with other information required for capture. Upon receipt of the capture token, the gateway compares a message made of the

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capture request data and the capture token data and transmits this information over a traditional credit/debit network. If an improperly formatted transaction is detected, payment gateway computer system **140** rejects the capture request. In function block **1245**, payment gateway computer system **140** determines the financial institution for which capture is requested by inspection of basic capture request **1110**. Payment gateway computer system **140** contacts the appropriate financial institution using a secure means, e.g, a direct-dial modem-to-modem connection, or a proprietary internal network that is not accessible to third parties, and using prior art means, instructs a computer at the financial institution to perform the requested funds transfer after settlement.

Payment Capture Response Generation

Function blocks **1250** through **1285** depict the steps of generating and transmitting a payment capture request response. Figures **13A** through **13F** depict views of the payment capture response and its component parts. In function block **1250**, payment gateway computer system **140** creates a basic capture response **710**. The basic capture request is a data area that includes all the information to indicate whether a capture request was granted or denied. Figure **13A** depicts basic authorization request **1310**. In function block **1255**, payment gateway computer system **140** combines basic capture response **1310**, and a copy of its signature public key certificate **1320**. Payment computer system **140** calculates a digital signature **1325** for the combined contents of the combined block **1330** comprising basic capture response **1310** and the signature public key certificate **1320**, and appends the signature to the combination of the combined basic authorization request **1310** and the signature public key certificate **1320**. The payment gateway computer system calculates digital signature **1325** by first calculating a message digest over the contents of the combined basic capture response **1310** and signature public key certificate **720**. The message digest is then encrypted using the merchant computer system's **140** digital signature private key, thus forming a digital signature.

Figure **13B** depicts the combined block **1330** formed by function block **1255** and containing basic capture request **1310**, the signature public key certificate **1320**, and digital signature **1325**. In function block **1260**, payment gateway computer system **140** generates a symmetric random encryption key **1340**, denoted as RK-4. Figure **13C** depicts random encryption key RK-4 **1340**. In function block **1275**, payment gateway computer system **140** encrypts combined block **1330** using

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random encryption key RK-4 1340 to form encrypted combined block 1350. Figure 13D depicts encrypted combined block 1350. The encryption state of encrypted combined block 1350 is graphically shown by random key lock 1355, which indicates that encrypted combined block 1350 is encrypted using random key RK-4 1340. In function block 1275, payment gateway computer system 140 encrypts random encryption key RK-4 1340 using the public key of merchant computer system 130 to form encrypted random key RK-4 1360. Figure 13E depicts encrypted random key RK-4 1360. The encryption state of encrypted random key 1360 is graphically shown by merchant public key lock 1365, which indicates that encrypted random key 1360 is encrypted using the merchant public key. In function block 1280, payment gateway computer system 140 concatenates encrypted combined block 1350 and encrypted random key RK-4 1360 to form merchant capture response 925. Figure 13F depicts merchant capture response 925 comprising encrypted combined block 1350 and encrypted random key RK-4 1360. In function block 1285, payment gateway computer system 140 transmits merchant capture response 925 to merchant system 130.

Payment Capture Response Processing

Figure 14 depicts the detailed steps of processing a payment capture response. In function block 1410, merchant computer system 130 applies its private key to encrypted random key RK-4 1360 contained within received merchant capture response 925, thereby decrypting it and obtaining a cleartext version of random key RK-4 1340. In function block 1420, merchant computer system 130 applies random key RK-4 1340 to encrypted combined block 1350, thereby decrypting it and obtaining a cleartext version of combined block 1330. Combined block 1330 comprises basic capture response 1310, a copy of payment gateway computer system's 140 signature public key certificate 1320, as well as payment gateway digital signature 1325. In function block 1430, merchant computer system 130 verifies payment gateway computer system's 140 signature public key certificate 1320. Merchant computer system 130 performs this verification by making a call to the certification authority associated with the certificate. If verification of the certificate fails, merchant computer system 130 concludes that the capture response is counterfeit and raises an error condition. In function block 1440, merchant computer system 130 validates payment gateway digital signature 1325. Merchant computer system 130 performs this validation by calculating a message digest over the contents of the combined basic authorization request 1310 and the signature public key certificate 1320. Merchant computer system 130 then decrypts digital

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signature 1325 to obtain a copy of the equivalent message digest calculated by payment gateway computer system 140 in function block 1255. If the two message digests are equal, the digital signature 1325 is validated. If validation fails, merchant computer system 130 concludes that the authorization response is counterfeit and raises an error condition. In function block 1450, merchant computer system 130 stores capture response for later use in by legacy system accounting programs, e.g. to perform reconciliation between the merchant operating merchant computer system 130 and the financial institution from whom payment was requested, thereby completing the transaction. The system of the present invention permits immediate deployment of a secure payment technology architecture such as the SET architecture without first establishing a public-key encryption infrastructure for use by consumers. It thereby permits immediate use of SET-compliant transaction processing without the need for consumers to migrate to SET-compliant application software.

VIRTUAL POINT OF SALE (vPOS) DETAILS

A Virtual Point of Sale (vPOS) Terminal Cartridge is described in accordance with a preferred embodiment. The vPOS Terminal Cartridge provides payment functionality similar to what a VeriFone PoS terminal ("gray box") provides for a merchant today, allowing a merchant to process payments securely using the Internet. It provides full payment functionality for a variety of payment instruments.

Payment Functionality

Figure 15A illustrates a payment processing flow in accordance with a preferred embodiment. The payment functionality provided by the vPOS terminal is divided into two main categories: "Merchant-Initiated" 1510 and "Consumer-Initiated" 1500. Some payment transactions require communication with the Acquirer Bank through the Gateway 1530. The normal flow of a transaction is via the vPOS Cartridge API 1512 to the vPOS C++ API 1514 into the payment protocol layer 1516 which is responsible for converting into the appropriate format for transmission to the Gateway for additional processing and forwarding to existing host payment authorization systems. Host legacy format refers to an existing authorization system for credit card approval currently utilized with the VeriFone Point of Sale (POS) gray terminals. The output from the payment protocol layer 1516 is transmitted to the authorization processing center via the gateway 1530. These transactions are referred to as "Online Transactions" or "Host Payments." The transactions that can be done locally by the merchant without having to communicate with the Acquirer Bank are referred to as "Local Functions and Transactions." To support different

types of payment instruments, the vPOS Terminal payment functionality is categorized as set forth below.

- 5 • **Host Payment Functionality:** These transactions require communication with the final host, either immediately or at a later stage. For example, an Online Authorization-Only transaction, when initiated, communicates with the host immediately. However, an Off-line Authorization-Only transaction is locally authorized by the vPOS terminal without having to communicate with the host, but at a later stage this off-line authorization transaction is sent to the host.
- 10 Within the Host Payment Functionality some transactions have an associated Payment Instrument, while others do not. These two kinds of transactions are:
 - 15 • **Host Financial Payment Functionality:** These transactions have a Payment Instrument (Credit Card, Debit Card, E-Cash, E-Check, etc.) associated with them. For example, the "Return" transaction, which is initiated upon returning a merchandise to the merchant.
 - 20 • **Host Administrative Payment Functionality:** These transactions do not require a payment instrument, and provide either administrative or inquiry functionality. Examples of these transactions are "Reconcile" or the "Batch Close."
 - 25 • **Local Functions and Transactions:** These transactions do not require communication with the host at any stage, and provide essential vPOS terminal administrative functionality. An example of this is the vPOS terminal configuration function, which is required to set up the vPOS terminal. Another example is the "vPOS Batch Review" function, which is required to review the different transactions in the vPOS Batch or the Transaction Log.

Payment Instruments

A preferred embodiment of a vPOS terminal supports various Payment Instruments. A consumer chooses a payment based on personal preferences. Some of the Payment Instruments supported include:

- 30 • Credit Cards
- Debit Cards
- Electronic Cash
- Electronic Checks
- Micro-Payments (electronic coin)
- 35 • Smart Cards

URL Table

The table below enumerates the URLs corresponding to the transactions supported by the vPOS Terminal Cartridge. Note that the GET method is allowed for all transactions; however, for transactions that either create or modify information on the merchant server, a GET request returns an HTML page from which the transaction is performed via a POST method.

Transaction	URL	POST	Access Control
HOST FINANCIAL PAYMENT FUNCTIONALITY			
auth capture	/vPOSt/mi/authcaptur e/	allowed	merchant login/password
auth capture	/vPOSt/ci/authcapture /	allowed	no access control
auth only	/vPOSt/mi/authonly/	allowed	merchant login/password
auth only	/vPOSt/ci/authonly/	allowed	no access control
adjust	/vPOSt/mi/adjust/	allowed	merchant login/password
forced post	/vPOSt/mi/forcedpost/	allowed	merchant login/password
offline auth	/vPOSt/mi/offlineauth/	allowed	merchant login/password
offline auth	/vPOSt/ci/offlineauth/	allowed	no access control
pre auth	/vPOSt/mi/preauth/	allowed	merchant login/password
pre auth comp	/vPOSt/mi/preauthcom p/	allowed	merchant login/password
return	/vPOSt/mi/return	allowed	merchant login/password
return	/vPOSt/ci/return/	allowed	no access control
void	/vPOSt/mi/void/	allowed	merchant login/password
HOST ADMINISTRATIVE PAYMENT FUNCTIONALITY			
balance inquiry	/vPOSt/mi/bi/	not allowed	merchant login/password

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host logon	/vPOSt/mi/hostlogon/	allowed	merchant login/password
parameter download	/vPOSt/mi/parameters dnld/	not allowed	merchant login/password
reconcile	/vPOSt/mi/reconcile/	allowed	merchant login/password
test host	/vPOSt/mi/testhost/	not allowed	merchant login/password

LOCAL FUNCTIONS & TRANSACTIONS

accum review	/vPOSt/mi/accum/revi ew/	not allowed	merchant login/password
batch review	/vPOSt/mi/batch/revie w/	not allowed	merchant login/password
cdt review	/vPOSt/mi/cdt/review/	not allowed	merchant login/password
cdt update	/vPOSt/mi/cdt/update /	allowed	merchant login/password
cpt review	/vPOSt/mi/cpt/review	not allowed	merchant login/password
cpt update	/vPOSt/mi/cpt/update /	allowed	merchant login/password
clear accum	/vPOSt/accum/clear/	allowed	merchant login/password
clear batch	/vPOSt/mi/batch/clear /	allowed	merchant login/password
hdt review	/vPOSt/mi/hdt/review/	not allowed	merchant login/password
hdt update	/vPOSt/mi/hdt/update /	allowed	merchant login/password
lock vPOS	/vPOSt/mi/lock/	allowed	merchant login/password
query txn	/vPOSt/ci/querytxn/	not allowed	no access control
query txn	/vPOSt/mi/querytxn/	not allowed	merchant login/password
tct review	/vPOSt/mi/tct/review/	not allowed	merchant login/password

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tct update	/vPOSt/mi/tct/update/	allowed	merchant login/password
unlock vPOS	/vPOSt/mi/unlock/	allowed	merchant login/password

URL Descriptions

This section describes the GET and POST arguments that are associated with each transaction URL. It also describes the results from the GET and POST methods. For URLs that produce any kind of results, the following fields are present in the HTML document that is returned by the vPOS Terminal Cartridge:

txnDate	Date of the transaction (mm/dd/yy or dd/mm/yy)
txnTime	Time of the transaction (hh:mm:ss GMT or hh:mm:ss local time)
merchantId	Merchant ID of the merchant using the vPOS terminal
terminalId	vPOS Terminal Id
txnNum	Transaction number of the given transaction
txnType	Type of transaction

For URLs that deal with financial transactions, the following fields are present in the HTML document that is returned by the vPOS terminal cartridge:

txnAmount	Transaction amount that is being authorized, forced posted, voided, etc.
poNumber	Purchase order number
authIdentNum	Authorization ID number for the transaction
retRefNum	Retrieval reference number for the given transaction
piInfo	Payment instrument information. This varies for different payment instruments. For example, in the case of credit cards, the credit card number (piAcctNumber) and expiration date (piExpDate) are returned.

Accumulate Review

URL Functionality: This is a local information inquiry function that retrieves the local (merchant's) transaction totals (accumulators).

GET Arguments: None.

GET Results: Retrieves the transaction totals for the merchant. Currently, the total is returned as an HTML document. The transaction totals currently returned are:

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creditAmt	Total Credit Amount since the last settlement logged in the vPOS terminal
creditCnt	Total Credit Count since the last settlement logged in the vPOS terminal
debitAmt	Total Debit Amount since the last settlement logged in the vPOS terminal
debitCnt	Total Debit Count since the last settlement logged in the vPOS terminal

Note: Accum Review is a local function, as opposed to Balance Inquiry which is done over the Internet with the host.

5

Adjust

URL Functionality: Corrects the amount of a previously completed transaction.

GET Arguments: None

GET Results: Because the Adjust transaction modifies data on the merchant server, the POST method should be used. Using the GET method returns an HTML form

10 that uses the POST method to perform the transaction.

POST Arguments:

pvsTxnNum	Previous transaction number
txnAdjustedAmount	The adjusted transaction amount. Note that the original transaction amount is easily retrievable from the previous transaction number.

15 **POST Results:** On success, pvsTxnNum and txnAdjustedAmount are presented in the HTML document, in addition to the transaction fields described above.

Auth Capture

URL Functionality: This transaction is a combination of Auth Only (Authorization without capture) and Forced Post transactions.

20 **GET Arguments:** None

GET Results: Because the Auth Capture transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form that uses the POST method to perform the transaction.

POST Arguments:

25

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piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields described above is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into a vPOS Terminal transaction log for both instances.

Auth Only

URL Functionality: Validates the cardholder's account number for a Sale that is performed at a later stage. The transaction does not confirm the sale to the host, and there is no host data capture. The vPOS captures this transaction record and later forwards it to confirm the sale in the Forced Post transaction request.

GET Arguments: None.

GET Results: Because the Auth Only transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form that uses the POST method to perform the transaction.

POST Arguments:

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into vPOS Terminal transaction log for both instances.

NOTE: The /vPOST/ci/authonly/ URL should be used for customer-initiated transactions. /vPOST/mi/authonly/ should be used for merchant-initiated transactions.

Balance Inquiry

URL Functionality: Performs an on-line inquiry of the merchant's balance.

GET Arguments: None

GET Results:

MrchtBlncAmt	Merchant balance amount for a given merchant. The balance amount at any given time is the difference between
--------------	--

the credit and debit amount since the last settlement between the merchant and the acquirer.

Batch Review

URL Functionality: Retrieves all records from the transaction log or the batch.

GET Arguments: None

- 5 **GET Results:** The GET method retrieves the transactions that have been batched in the vPOS terminal for future reconciliation. The batch can be cleared from the vPOS terminal after a manual reconciliation between the acquirer and the vPOS. The batch data is retrieved as a set of records and is formatted as a table in the HTML document. The following fields are present in a typical record:

10

NTransType	Transaction type
NPurchOrderNo	Purchase order number
SzAcctNum	Customer's payment instrument account number
SzExpDate	Customer's payment instrument expiration date
SzTransAmt	Transaction amount
SzTransDate	Transaction date
SzTransTime	Transaction time
SzRetrievalRefNum	Transaction's retrieval reference number
SzAuthId	Authorization ID for the transaction
SzOrigAmt	Original transaction amount
SzBatchNum	Batch number for the given transaction
NCurrencyType	Currency in which the transaction was done
LnTransNum	Transaction number

CDT Review

URL Functionality: Displays the vPOS terminal configuration data corresponding to the Card Definition Table (CDT).

- 15 **GET Arguments:** None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted using the /vPOST/mi/cdt/update/ URL to update the card definition table. Not all fields in the card definition table are editable. The following fields are returned in a form to the user:

20

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NHostIndex	Index into the Host Definition Table or the Acquirer that maps to this card issuer.
SzPANLo	Low end of the PAN (Primary Account Number) range
SzPANHi	High end of the PAN range
NMaxPANDigit	Maximum number of digits in the PAN for this acquirer.
NMinPANDigit	Minimum number of dits in the PAN for the acquirer
SzCardLabel	Card Issuer's name
Transactions	Specifies if a particular transaction is allowed for a given card range.
Available bit vector	

CDT Update

URL Functionality: Updates the vPOS terminal configuration data corresponding to the Card Definition Table (CDT).

GET Arguments: None

5 **GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the /vPOST/mi/cdt/update URL to update the card definition table.

POST Arguments: (Editable CDT fields need to be decided.)

POST Results: (Depends on editable CDT fields, and therefore needs to be decided.)

10

Clear Accumulator

URL Functionality: Zeroes out the accumulator totals currently resident in the vPOS terminal.

GET Arguments: None.

15 **GET Results:** Presents a form that uses the POST method to zero the accumulators.

POST Arguments: None.

POST Results: Zeroes the accumulators/transaction totals in the vPOS terminal.

Clear Batch

20 **URL Functionality:** Zeroes out the transaction logs currently batched in the vPOS terminal.

GET Arguments: None.

GET Results: Presents a form that uses the POST method to clear the batch.

POST Arguments: None.

25 **POST Results:** Zeroes the transactions that comprise the batch in the vPOS terminal.

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Forced Post

URL Functionality: Confirms to the host the completion of a sale, and requests for data capture of the transaction. This is used as a follow-up transaction after doing an Authorization (Online or Off-line) transaction.

5 **GET Arguments:** None.

GET Results: Returns the HTML form for performing the Forced Post transaction.

POST Arguments:

pvsTxnNum the previous transaction number from an auth only transaction

10 **POST Results:** On success, pvsTxnNum is presented in the HTML document. On failure, an HTML document is returned that contains the reason for the failure of the transaction.

HDT Review

15 **URL Functionality:** Displays the vPOS terminal configuration data corresponding to the Host Definition Table (HDT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted using the /vPOSt/mi/hdt/update URL to update the hosts definition table. Not all fields in the host definition table are editable. The following fields are returned in a form to the user:

szTermId	Terminal ID for this vPOS terminal
szMerchId	Merchant ID for this vPOS terminal
szCurrBatchNum	Current batch number existing on the vPOS
szTransNum	Reference number for the next transaction in the vPOS transaction log/batch. This is generated by vPOS and is not editable by the merchant.
szTPDU	Transport Protocol Data Unit. Required for building the ISO 8583 packet.
InSTAN	System trace number; message number of the next transaction to be transmitted to this acquirer.
szNII	Network International Number. Required for building the ISO 8583 packet.
szHostName	Name for identifying the host.

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nHostType	Host type
nNumAdv	Number of off-line transactions that can be piggy-backed at the end of an on-line transaction.
Data Capture	Specifies for which transactions data capture is
Required Bit	required.
vector:	

HDT Update

URL Functionality: Updates the vPOS terminal configuration data corresponding to the Host Definition Table (HDT).

GET Arguments: None

- 5 **GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted to the merchant server using the /vPOST/mi/hdt/update URL to update the host definition table

Unlock vPOS

URL Functionality: Local function that starts the vPOS at the start of the day.

- 10 **GET Arguments:** None.

GET Results: Returns an HTML form that uses the POST method to perform this transaction.

POST Arguments: None.

- 15 **POST Results:** Resets a Boolean flag on the merchant server that enables transactions to be accepted by the vPOS terminal.

Offline Auth

- 20 **URL Functionality:** This transaction is same as the "Authorization Only" transaction, except that the transaction is locally captured by the vPOS terminal without having to communicate with the host. A Forced Post operation is done as a follow-up operation of this transaction.

GET Arguments: None.

GET Results: Because the Offline Auth transaction modifies data on the merchant server side, the POST method should be used. Using the GET method returns an HTML form for using the POST method to perform the transaction.

- 25 **POST Arguments:**

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date
txnAmt	Transaction amount

POST Results: On success, an HTML document that contains the transaction fields described in Section 4.1 is returned. On failure, an HTML document that contains the reason for the failure of the transaction is returned. The transaction is logged into vPOS terminal transaction log for both instances.

5

Parameter Download

URL Functionality: Downloads the vPOS configuration information from the host and sets up the vPOS in the event of the configuration data being changed.

GET Arguments: None

10 **GET Results:** Retrieves an HTML form that uses the POST method for the parameter download transaction.

POST Arguments: None.

POST Results: Downloads the following parameters from the host-and uploads them into the vPOS terminal configuration table.

- 15
 - card/issuer definition table (CDT)
 - host/acquirer definition table (HDT)
 - communications parameter table (CPT)
 - terminal configuration table (TCT)

The various configuration parameters can be reviewed and modified using the URLs for the desired functionality.

20

Pre Auth

URL Functionality: Used in lodging and hotel establishments to pre-authorize a charge that is completed some time in future.

GET Arguments: None

GET Results: Retrieves the HTML form for posting the pre-authorization transaction.

25

POST Arguments:

piAcctNumber	Payment Instrument account number, e.g., Visa credit card number
piExpDate	Expiration date

Pre Auth Comp

URL Functionality: Completes a pre-authorization transaction.

GET Arguments: None

30 **GET Results:** Retrieves the HTML form for posting the pre-authorization completion transaction.

POST Arguments:

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pvsTxnNum Previous transaction number from an auth only
transaction

POST Results: On success, pvsTxnNum is presented in the HTML document. On failure, an HTML document is returned that contains the reason for the failure of the transaction.

5

Reconcile

URL Functionality: This transaction is done at the end of the day to confirm to the host to start the settlement process for the transactions captured by the host for that particular vPOS batch.

10 **GET Arguments:** None

GET Results: Retrieves the HTML form for posting the Reconcile transaction.

POST Arguments: None.

15 **POST Results:** On success, the reconcile function prints any discrepancies in the merchant's batch of transactions and totals vis-a-vis the host's batch of transactions in totals. The output format is a combination of the output of the Batch Review and Accum Review transactions.

Return

20 **URL Functionality:** Credits the return amount electronically to the consumer's account when previously purchased merchandise is returned. The vPOS terminal captures the transaction record for this transaction.

GET Arguments: None

GET Results: Retrieves the HTML form for posting the Return transaction.

POST Arguments:

25 PrevTxnNum Reference to the previous transaction number

The previous transaction has access to the following fields:

TxnAmount	Transaction amount
PiAccountNum	Payment instrument account number
PiExpDate	Payment instrument expiration date

POST Results: On success, pvsTxnNum is presented in the HTML document, in addition to

Test Host

5 **URL Functionality:** Checks the presence of the host and also the integrity of the link from the vPOS to the host.

GET Arguments: None.

GET Results: On success, an HTML document is returned that reports success in connecting to the host. On failure, an HTML document is returned that reports the error encountered in testing the host.

10 **Lock vPOS**

URL Functionality: This local function locks or stops the vPOS terminal from accepting any transactions.

GET Arguments: None.

GET Results: Returns an HTML form that posts the locking of the vPOS terminal.

15 **POST Arguments:** None.

POST Results: On success, an HTML document is returned that contains the status that vPOS terminal was successfully. On failure, an HTML document is returned that reports the cause of failure of the operation, e.g., access denied, the vPOS terminal is already locked or is presently processing a transaction, etc.

20 **Void**

URL Functionality: Cancels a previously completed draft capture transaction.

GET Arguments: None.

GET Results: Retrieves an HTML form for posting the Void transaction.

POST Arguments:

25

pvsTxnNum	Transaction number from a previous Auth Only transaction.
-----------	---

Host Logon

30 **URL Functionality:** Administrative transaction used to sign-on the vPOS with the host at the start of the day, and also to download encryption keys for debit transactions.

GET Arguments: None

GET Results: Retrieves an HTML form for posting the Host Logon transaction.

POST Arguments: None.

POST Results: Currently, debit card based transactions are not supported. The result is an HTML document indicating the success or failure of the host logon operation.

CPT Review

- 5 **URL Functionality:** Returns the vPOS terminal configuration data corresponding to the Communications Parameter Table (CPT).

GET Arguments: None

- GET Results:** The GET method returns a default HTML form that contains the current configuration values corresponding to the vPOS terminal's communication parameters. The form can be filled out and posted to the merchant server using the /vPOST/mi/cpt/update URL to update the communications parameter table. The following fields are returned in a form to the user:

SzAcqPriAddress	Primary Host address
SzAcqSecAddress	Secondary Host address
SzActTerAddress	Tertiary Host address
NRespTimeOut	Time-out value (in seconds) before which the vPOS should receive a response from the host

CPT Update

- 15 **URL Functionality:** Updates the vPOS terminal configuration data corresponding to the Communications Parameter Table (CPT).

GET Arguments: None

- GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be modified and posted to update the communication parameter table.

POST Arguments:

SzAcqPriAddress	Primary Host address
SzAcqSecAddress	Secondary Host address
SzActTerAddress	Tertiary Host address
NRespTimeOut	Time-out value (in seconds) before which the vPOS should receive a response from the host

- 25 **POST Results:** On success, the HTML document returned by the vPOS contains the values set by the merchant. On failure, the HTML document contains the reason for the failure of the invocation of the URL.

TCT Review

URL Functionality: Returns the vPOS terminal configuration data corresponding to the Terminal Configuration Table (TCT).

GET Arguments: None.

- 5 **GET Results:** The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the /vPOST/mi/tct/update URL to update the terminal configuration table. The following fields are returned in a form to the user:

SzMerchName	Merchant name
SzSupervisorPwd	Supervisor password
FvPOSLock	1 = vPOS locked, 0 = vPOS unlocked
SzAuthOnlyPwd	Password for initiating auth-only transaction
SzAuthCaptPwd	Password for initiating auth with capture transaction
SzAdjustPwd	Password for adjust transaction
SzRefundPwd	Password for refund transaction
szForcedPostPwd	Password for forced post transaction
szOfflineAuthPwd	Password for offline auth transaction
szVoidPwd	Password for void transaction
szPreAuthPwd	Password for pre-authorization transaction
szPreAuthCompP	Password for pre-authorization completion
wd	

TCT Update

- 10 **URL Functionality:** Updates the vPOS terminal configuration data corresponding to the Terminal Configuration Table (TCT).

GET Arguments: None

GET Results: The GET method returns a default HTML form that contains the current configuration values. The form can be filled out and posted using the

- 15 /vPOST/mi/tct/update URL to update the terminal configuration table.

POST Arguments: All arguments in TCT Review functionality are the returned values from the /vPOST/mi/tct/update the URL.

szMerchName	Merchant name
szSupervisorPwd	Supervisor password
fvPOSLock	1 = vPOS locked, 0 = vPOS unlocked
szAuthOnlyPwd	Password for initiating auth-only transaction
szAuthCaptPwd	Password for initiating auth with capture transaction
szAdjustPwd	Password for adjust transaction

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szRefundPwd	Password for refund transaction
szForcedPostPwd	Password for forced post transaction
szOfflineAuthPwd	Password for offline auth transaction
szVoidPwd	Password for void transaction
szPreAuthPwd	Password for pre-authorization transaction
szPreAuthCompP	Password for pre-authorization completion
wd	

POST Results: On success, the POST modifies values of the terminal configuration table parameters. On failure, the HTML document contains the reason for the failure of the transaction.

5

Query Transactions

URL Functionality: Permits the merchant and customer to query a given transaction corresponding to a transaction number.

GET Arguments:

txnNum	Transaction number
--------	--------------------

10 **GET Results:** For a given transaction, the URL returns an HTML document. If a transaction refers to an older transaction, the transaction's entire history is made available.

URL results

15 Depending upon the method (GET/POST) as well as the success or failure of the HTTP request, different documents are returned to the user. The vPOS terminal provides a framework whereby different documents are returned based upon a number of preferences. Currently the language and content-type are supported as preferences. A simple framework is proposed here. Each of the transaction has a set of documents associated with it: form for the payment transaction, GET success, 20 GET failure, POST success, and POST failure.

25 In the directory structure defined below, documents are stored corresponding to the preferences. The top level of the directory structure is the content-type, the next level is language (for NLS support). For example, to create text/html content in US English & French, the directory structure given below would contain the HTML documents for each of the transactions. The vPOS terminal cartridge has a configuration file that allows the user to specify the content-type as well as the language to be used for a cartridge. The first release of the vPOS terminal cartridge supports one content-type and language for each server.

Data Structures & Functions

Functions

A brief description of the Virtual Point of Sale Terminal cartridge functions are provided below. vPOSTInit(), vPOSTExec() and vPOSTShut() are the entry points
5 required for each cartridge in accordance with a preferred embodiment. The other functions implement some of the key vPOST cartridge functionality. In the block diagram shown in Figure 15B, the vPOS provides an interface for transactions which are initiated both by the consumer and the merchant. The merchant initiates a transaction from a Graphical User Interface (GUI) 1550 and all the transactions that
10 are initiated by the consumer are routed by the Merchant WEB Server 1545.

The Authorization/Data Capture Module 1560 processes the requests originated by the merchant or the consumer and routes them to the Protocol Module 1565. The Protocol Module is responsible for building the payment protocol request packet
15 (e.g., an SSL-encapsulated ISO 8583 packet) 1570 before sending the request to the Gateway 1579. Then, the Gateway 1579 awaits a response from the Protocol Module 1565, and upon receiving the response, the Gateway 1579 parses the data and provides unwrapped data to the Authorization/Data-Capture Module 1560. The Authorization/Data-Capture Module 1560 analyzes the response and updates the
20 Transaction Log 1580. The Transaction Log 1580 contains information concerning any successfully completed transactions and the accumulators or the transaction totals. The vPOS terminal creates and maintains the Transaction Log 1580, and the vPOS Configuration Data 1585 contains information which is used to configure the behavior of the vPOS. The entire vPOS functionality is thread-safe and hence using
25 the vPOS in a multi-threaded environment does not require any additional interfacing requirements. Figures 36-48 are vPOS screen displays in accordance with a preferred embodiment.

Payment Functionality

As discussed above, the different Payment Functionality provided by the vPOS
30 terminal can be divided into two main categories as "Merchant Initiated" and "Consumer Initiated." Some of these transactions require communication with the Gateway and these transactions are referred to as "Online Transactions." The transactions which can be done locally to the merchant without having to communicate are referred to as "Local Functions/Transactions." In order to provide
35 support for many different types of Payment Instruments, the vPOS Payment Functionality have been categorized. Host payment functionality and transactions require communication with the host either immediately or at a later stage. Each of

the host financial payment transactions come to this category and require a Payment Instrument. These transactions can be initiated with different types of Payment Instruments which the vPOS terminal supports.

- 5 An authorization without capture transaction is used to validate the card holder's account number for a sale that needs to be performed at a later stage. The transaction does not confirm a sale's completion to the host, and there is no host data capture in this event. The vPOS captures this transaction record and later forwards it to the host to confirm the sale in a forced post transaction request. An
- 10 authorization without capture transaction can be initiated both by the consumer and the merchant. A forced post transaction confirms to a host computer that a completion of a sale has been accomplished and requests data capture of the transaction. The forced post transaction is used as a follow-up transaction after doing an authorization (Online or Off-line) transaction. The transaction can be
- 15 initiated only by the merchant. The authorization with post transaction is a combination of authorization without capture and forced post transactions. This transaction can be initiated both by the consumer and the merchant.

- The offline post transaction is identical to the "authorization without capture"
- 20 transaction, except that the transaction is locally captured by the vPOS without initiating communication with a host. A forced post operation is done as a follow-up operation of this transaction. This transaction can be initiated by both the consumer and the merchant. The return transaction is used to credit the return amount electronically to the consumer's account when a purchased merchandise is
- 25 returned. The vPOS captures the return transaction record when the merchandise is returned, and this transaction can be initiated only by the merchant. The void transaction cancels a previously completed draft capture transaction. The vPOS GUI provides an interface for retrieving a transaction record required to be voided from the batch and passes it to the Authorization/Data-Capture module after
- 30 confirmation. The batch record is updated to reflect the voided transaction after getting an approval from the gateway. This transaction can be initiated only by the merchant.

- The pre-authorization transaction is identical to the authorization without capture
- 35 transaction, but the consumers' "open-to-buy" amount is reduced by the pre-authorization amount. An example of this type of transaction is the "check-in" transaction in a hotel environment. A check-in transaction sends a pre-

authorization request to the host, so that an amount required for the customers' stay in the hotel is reserved. The pre-authorization transaction is followed by a pre-authorization complete transaction. This transaction can be initiated both by the consumer and the merchant.

5

The pre-authorization complete transaction is done as a follow-up to the pre-authorization transaction. This transaction informs the host of the actual transaction amount. The pre-authorization complete transaction amount could be more or less than the pre-authorization amount. An example is the "check-out" transaction in a hotel environment. The check-out amount can be less than or more than the check-in amount. This transaction can only be initiated by a merchant.

10

The adjust transaction is initiated to make a correction to the amount of a previously completed transaction. The adjust transaction can be initiated only by the merchant. The host administrative transactions do not require any payment instrument. The balance inquiry transaction is used for on-line inquiry into the balance of the merchant's account. The batch data or the configuration data is not affected by this transaction. The reconciliation or close transaction is processed at the end of the day to start the settlement process for the transactions captured by the host for that particular vPOS. The host log-on transaction is an administrative transaction which is used to synchronize the vPOS with the host at the start of the day and also initiate a fresh batch at the vPOS terminal.

15

20

The parameters download transaction is used to download the vPOS configuration information from the host and set-up the vPOS in the event of any change in the configuration data. A test transaction is used to detect the presence of a host and the status of a link from the vPOS to the host. Local transactions or functions are initiated by a merchant and do not require communication with the gateway. These transactions can only be initiated by a merchant. The totals or accumulators review is a local information inquiry function and is used to retrieve the local (merchant's) totals. The detail transaction or the batch review function is used to retrieve all the records from the transaction log or the batch. The clear batch function is used to start a fresh batch. This transaction is utilized to electronically reconcile the vPOS with the host and to manually reconcile the vPOS with the host. After completing the manual reconciliation processing, the merchant can initiate this transaction to start a fresh batch. The clear accumulator function is similar to the clear batch functionality and resets all vPOS terminal accumulators to zero. This function is

25

30

35

required when the merchant is not able to reconcile the vPOS with the host electronically. The vPOS unlock or start transaction is a local function used to start the vPOS at the start of the day. The vPOS lock or stop function is used to Lock or stop the vPOS from accepting any transactions. The vPOS configuration setup function is used to setup the vPOS configuration data. The vPOS configuration data is divided into different tables, for example, the Card/Issuer Definition Table (CDT), the Host/Acquirer Definition Table (HDT), the Communications Parameters Table (CPT) and the Terminal Configuration Table (TCT). The following sections explain each of these configuration tables in detail.

Host Definition Table (HDT)

The table contains information specific to the acquirer.

Field	Attributes/ Bytes	Field Description/Comments
Terminal Identifier	ANS(20)	Terminal ID for this acquirer/host
Merchant Identifier	ANS(20)	Merchant ID for this acquirer/host
Current Batch Number	N(6)	Batch Number for the batch currently existing on the vPOS
Transaction Number	I(2)	Reference Number for next transaction in the vPOS transaction log/batch (vPOS generated)
TPDU	AN(10)	Transport Protocol Data Unit - Required for building the ISO 8583 packet.
STAN	L(4)	Systems Trace Number - Message Number of the transaction to be transmitted next for this acquirer.
NII	N(3)	Network International Identifier - Required for building the ISO 8583 packet.
Host Name or Label	ANS(20)	Name for identifying the host, e.g., "AMEX-SIN". This is only a text string and is used for the purpose of identifying the host.
No. of advice messages	I(2)	No. of off-line transactions (advice messages) that can be piggy-backed at the end of an on-line transaction. If set to zero then piggy-backing is disabled.

The following fields specify whether Data Capture is required for a particular transaction for this acquirer.

Field	Attributes/ Bytes	Field Description/Comments
Host Protocol Type	I(2)	Host Protocol type, e.g., ISO 8583, SET, etc.,
Host Protocol Sub-Type	I(2)	Sub protocol type, e.g., AMEX-ISO8583, MOSET, etc.,
Auth Only DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Auth Capture DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Adjust DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Refund DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Cash Advance DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Cash Back DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Off-line Auth DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Void DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Pre-Auth DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED
Pre-Auth Complete DC Flag	Bit(1 bit)	1 = REQUIRED, 0 = NOT REQUIRED

Card Definition Table (CDT)

This table contains information which are specific to the card issuer.

Field	Attributes/ Bytes	Field Description/Comments
Host Index	I(2)	Index into the HDT or the acquirer which maps to this card issuer.
PAN Low Range	N(19)	Low end of the PAN range .
PAN High Range	N(19)	High end of the PAN range.
Minimum PAN digits	I(2)	The minimum number of digits in the PAN for this acquirer.
Maximum PAN digits	I(2)	The maximum number of digits in the PAN for this acquirer.
Card Label	ANS(20)	Card Issuer Name for identification, e.g., VISA.

The following fields specify whether a particular transaction is allowed for a card range.

Field	Attributes/ Bytes	Field Description/Comments
Auth Only Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Auth Capture Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Adjust Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Refund Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Cash Advance Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Cash Back Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Off-line Auth Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Void Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Pre-Auth Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED
Pre-Auth Complete Allowed	Bit(1 bit)	1 = ALLOWED, 0 = NOT ALLOWED

Communications Parameter Table (CPT)

- 5 This table contains communications parameters information specific to an acquirer. The HDT and this table have a one-to-one mapping between them.

Field	Attributes/ Bytes	Field Description/Comments
Primary Address	AN(100)	Primary Host Address (Telephone number, IP address, etc.)
Secondary Address	AN(100)	Secondary Host Address to be used if the Primary Address is busy or not available.
Tertiary Address	AN(100)	Tertiary Host Address.
Response Time-out	I(2)	Time-out value (in seconds) before which the vPOS should receive a response from the host.

Terminal Configuration Table (TCT)

- 10 This table contains information specific to a particular vPOS terminal.

Field	Attributes/ Bytes	Field Description/Comments
-------	----------------------	----------------------------

	Bytes	
Merchant Name	ANS(100)	Name of the merchant having the vPOS terminal.
vPOS Lock Flag	Bit (1 bit)	1 = vPOS Locked, 0 = vPOS Unlocked

Payment Instruments

As discussed above, the vPOS terminal supports different Payment Instruments and each of the Payment Functions described above can be initiated by these different Payment Instruments. The consumer making a purchase from a merchant provides a choice of payment methods depending upon their personal preference. The Payment Instrument Class Hierarchy which is used by the different vPOS terminal Payment Functions is described below.

Message Sequence Diagram

Figure 17 shows a typical message flow between the consumer, merchant, vPOS terminal and the Gateway. This section describes the different classes listed in the previous section, their data and members, and defines the type of the transaction that is to be performed. Processing commences at 1700 when a merchant server receives a sales order and passes it via the vPOS Graphical User Interface (GUI) 1710 to an authorizer 1720 for approval and subsequent protocol processing 1730 and ultimately transmission via the gateway 1740 to the network.

20 **Class Name :**

CVPCLTransaction

Data :

Transaction Type (int)
 Transaction Date and Time (CPCLDateTime)
 25 Card Definition Table (CVPCL_CDT)
 Host Definition Table (CVPCL_HDT)
 Communications Parameters Table (CVPCL_CPT)
 Terminal Configuration Parameters (CVPCL_TCT)
 Batch Record (CVPCLBatch)
 30 Accumulator Record (CVPCLAccum)

Member Functions :

CVPCLTransaction();
 EStatus GetTransType();

-50-

```

    EStatus GetTransDateTime(CPCLDateTime&);
    EStatus SetTransType(const int);
    virtual EStatus InitializeTrans(TvPOSParamsBlk *) = 0;
    virtual EStatus ExecuteTrans(TvPOSResultsBlk *) = 0;
5    virtual EStatus ShutDown() = 0;

```

Host Transaction Class Definitions

This section contains all the host transaction class definitions.

10 Host Transaction Class (CVPCLHostTrans)

This is an abstract base class derived from the CVPCLTransaction class and is used for deriving transaction classes which need to communicate with the host either immediately or at a later stage.

15 Class Name :

CVPCLHostTrans

Data :

Member Functions :

20 CVPCLHostTrans();

Financial Transaction Class (CVPCLFinancialTrans)

This is an abstract base class derived from the CVPCLHostTrans. This class is used to derive transaction classes which require a payment instrument (e.g., a Credit Card) associated with them to perform the transaction.

Class Name :

CVPCLFinancialTrans

Data :

```

30       Transaction Amount (CVPCLAmt)
         Purchase Order Number (char[][])
         Transaction Number (char[])
         Authorization Identification Number (char[])
         Retrieval Reference Number (char[])
35       Batch (CVPCLBatch)
         Accumulators (CVPCLAccumulators)

```

Member Functions :

-51-

```
CVPCLFinancialTrans();
EStatus GetTransAmt(CVPCLAmt&);
EStatus GetPurchOrderNum(char *);
EStatus GetTransRefNum(char *);
5 EStatus GetRetRefNum(char *);
EStatus GetAuthId(char *);
EStatus GetCurrencyType(EPCLCurrency *);
EStatus SetPurchOrderNum(const char *);
EStatus SetTransRefNum(const char *);
10 EStatus SetRetRefNum(const char *);
EStatus SetAuthId(const char *);
EStatus SetCurrencyType (const char *)
```

15 **Financial Credit Card Transaction Class (CVPCLFinCCTrans)**

This is the base abstract class for the financial host transaction which require a Credit Card payment instrument. This class is derived from the CVPCLFinancialTrans.

20 **Class Name :**

CVPCLFinCCTrans

Data :

Credit Card Payment Instrument (CPCLCreditCard)

25 **Member Functions :**

CVPCLFinCCTrans();

Credit Card Authorization Only Transaction Class (CVPCL_CCAuthOnly)

30 This is the class derived from the CVPCLFinCCTrans class and implements the Authorization Only Transaction.

Class Name :

CVPCL_CCAuthOnly

35 **Data :**

Member Functions :

-52-

CVPCCL_CCAuthOnly();
EStatus InitializeTrans(TvPOSParamsBlk *);
EStatus ExecuteTrans(TvPOSResultsBlk *);
EStatus ShutDownTrans();
5 EStatus FormBatchRec();

Credit Card Authorization with Capture Transaction Class (CVPCCL_CCAuthCapt)

This is the class derived from the CVPCCLFinCCTrans class and implements the
Authorization with Data Capture Transaction.

10

Class Name :**CVPCCL_CCAuthCapt****Data :****Member Functions :**

15 CVPCCL_CCAuthCapt();
EStatus InitializeTrans(TvPOSParamsBlk *);
EStatus ExecuteTrans(TvPOSResultsBlk *);
EStatus ShutDownTrans();
EStatus FormBatchRec();

20

Credit Card Return Transaction Class (CVPCCL_CCReturn)

This is the class derived from the CVPCCLFinCCTrans class and implements the
Return Transaction.

25 **Class Name :****CVPCCL_CCReturn****Data :****Member Functions :**

30 CVPCCL_CCReturn();
EStatus InitializeTrans(TvPOSParamsBlk *);
EStatus ExecuteTrans(TvPOSResultsBlk *);
EStatus ShutDownTrans();
EStatus FormBatchRec();

35

Credit Card Pre-Authorization Transaction Class (CVPCCL_CCPreAuth)

This is the class derived from the CVPCLFinCCTrans class and implements the Pre-Authorization Transaction.

Class Name :

5 **CVPCL_CCPreAuth**

Data :

Member Functions :

 CVPCL_CCPreAuth();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
10 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();
 EStatus FormBatchRec();

**Credit Card Off-line Authorization Only Transaction Class
(CVPCL_CCOfflineAuth)**

15

This is the class derived from the CVPCLFinCCTrans class and implements the Offline Authorization Class Transaction.

Class Name :

20 **CVPCL_CCOfflineAuth**

Data :

Member Functions :
 CVPCL_CCOfflineAuth();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
25 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();
 EStatus FormBatchRec();

Credit Card Adjust Transaction Class (CVPCL_CCAdjust)

30 This is the class derived from the CVPCLFinCCTrans class and implements the Adjust Transaction.

Class Name :

CVPCL_CCAdjust

35 Data :

Member Functions :

-54-

```
    CVPCL_CCAdjust();
    EStatus InitializeTrans(TvPOSPParamsBlk *);
    EStatus ExecuteTrans(TvPOSResultsBlk *);
    EStatus ShutDownTrans();
5    EStatus FormBatchRec();
```

Credit Card Void Transaction Class (CVPCL_CCVoid)

10 This is the class derived from the CVPCLFinCCTrans class and implements the Void Transaction.

Class Name :

CVPCL_CCVoid

Data :

15

Member Functions :

```
    CVPCL_CCVoid();
    EStatus InitializeTrans(TvPOSPParamsBlk *);
    EStatus ExecuteTrans(TvPOSResultsBlk *);
20    EStatus ShutDownTrans();
    EStatus FormBatchRec();
```

Credit Card Forced Post Transaction Class (CVPCL_CCForcedPost)

25 This is the class derived from the CVPCLFinCCTrans class and implements the Forced Post Transaction.

Class Name :

CVPCL_CCForcedPost

Data :

30

Member Functions :

```
    CVPCL_CCForcedPost();
    EStatus InitializeTrans(TvPOSPParamsBlk *);
    EStatus ExecuteTrans(TvPOSResultsBlk *);
35    EStatus ShutDownTrans();
    EStatus FormBatchRec();
```


Pre-Authorization Complete Transaction Class (CVPCL_CCPreAuthComp)

This is the class derived from the CVPCLFinCCTrans class and implements the Pre-Authorization Completion Transaction.

5 **Class Name :**

CVPCL_CCPreAuthComp

Data :

Member Functions :

10 CVPCL_CCPreAuthComp();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();
 EStatus FormBatchRec();

15

Credit Card Balance Inquiry Class (CVPCL_CCBalanceInq)

This class is derived from the CVPCLFinCCTrans class and is used to perform the Merchant Balance Inquiry function.

20 **Class Name :**

CVPCL_CCBalanceInq

Data :

Member Functions :

25 CVPCL_CCBalanceInq();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

30 **Administrative Host Transaction Class (CVPCLAdminHostTrans)**

This is an abstract base class derived from the CVPCLHostTrans class and is used to derive the administrative host transaction classes.

Class Name :

35 **CVPCLAdminHostTrans**

Data :

Member Functions :

CVPCLAdminHostTrans();
int GetHostIndex();
EStatus SetHostIndex (const int);

5

Reconcile Transaction Class (CVPCLReconcile)

This is the class derived from the CVPCLAdminHostTrans class and implements the Reconcile or Close functionality.

Class Name :10 **CVPCLReconcile****Data :****Member Functions :**

CVPCLReconcile();
15 EStatus InitializeTrans(TvPOSPParamsBlk *);
EStatus ExecuteTrans(TvPOSResultsBlk *);
EStatus ShutDownTrans();

Host Log-on Transaction Class (CVPCLHostLogon)

20 This is the class derived from the CVPCLAdminHostTrans class and implements the Host Log-on Transaction.

Class Name :**CVPCLHostLogon**25 **Data :****Member Functions :**

CVPCLHostLogon();
EStatus InitializeTrans(TvPOSPParamsBlk *);
30 EStatus ExecuteTrans(TvPOSResultsBlk *);
EStatus ShutDownTrans();

Parameters Download Transaction Class (CVPCLParamsDwnld)

This is the class derived from the CVPCLAdminHostTrans class and implements the
35 Parameters Download (vPOS configuration information from the host) functionality.

Class Name :

CVPCLParamsDwnld**Data :****Member Functions :**

5 CVPCLParamsDwnld();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

10 **Test Transaction Class (CVPCLTestHost)**

This is the class derived from the CVPCLAdminHostTrans class and implements the Test functionality which is used to test the host and the link.

Class Name :

15 **CVPCLTestHost**

Data :**Member Functions :**

 CVPCLTestHost();
20 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

Local Transaction Class Definitions (CVPCLLocalTrans)

25 This is the abstract base class for all the transactions that are performed locally to the vPOS.

Class Name :**CVPCLLocalTrans**

30 **Data :**

 Record Number (int)
 Host Index (int)

Member Functions :

 CVPCLLocalTrans();
35 int GetRecNum();
 int GetHostIndex()
 EStatus SetRecNum(const int);

EStatus SetHostIndex(const int);

Virtual POS Lock/Stop Class (CVPCLvPOSLock)

This class implements the vPOS Lock or the Stop Local functionality. Under the

- 5 locked state the vPOS does not accept any transaction requests. The class is derived from the CVPCLLocalTrans base class.

Class Name :

CVPCLvPOSLock

Data :

- 10 **Member Functions :**

CVPCLvPOSLock();

EStatus InitializeTrans(TvPOSParamsBlk *);

EStatus ExecuteTrans(TvPOSResultsBlk *);

EStatus ShutDownTrans();

15

Virtual POS UnLock/Start Class (CVPCLvPOSUnlock)

This class implements the vPOS UnLock or the Start Local functionality. The class is derived from the CVPCLLocalTrans base class.

- 20 **Class Name :**

CVPCLvPOSUnlock

Data :

Member Functions :

- 25 CVPCLvPOSUnlock();

EStatus InitializeTrans(TvPOSParamsBlk *);

EStatus ExecuteTrans(TvPOSResultsBlk *);

EStatus ShutDownTrans();

- 30 **Transaction Data Administration Class (CVPCLTransDataAdmin)**

This is an abstract base class used to derive the classes which are required to review/manage the transaction data which includes the batch data and the accumulator data. The class is derived from the CVPCLLocalTrans base class.

- 35 **Class Name :**

CVPCLTransDataAdmin

Data :

Member Functions :

CVPCLTransDataAdmin();

Batch Review Class (CVPCLBatchReview)

- 5 This class is derived from the CVPCLTransDataAdmin base class and implements the batch review functionality

Class Name :

CVPCLBatchReview

Data :

10

Member Functions :

CVPCLBatchReview();

EStatus InitializeTrans(TvPOSPParamsBlk *);

EStatus ExecuteTrans(TvPOSResultsBlk *);

15

EStatus ShutDownTrans();

Clear Batch Class (CVPCLClearBatch)

- 20 This class is derived from the CVPCLTransDataAdmin base class and implements the clear batch functionality, which is used to clear the batch in the event of doing a manual reconciliation between the vPOS and the acquirer.

Class Name :

CVPCLClearBatch

Data :

25

Member Functions :

CVPCLClearBatch();

EStatus InitializeTrans(TvPOSPParamsBlk *);

EStatus ExecuteTrans(TvPOSResultsBlk *);

EStatus ShutDownTrans();

30

Accumulators Review Class (CVPCLAccumReview)

- This class is derived from the CVPCLTransDataAdmin base class and implements the Accumulators Review functionality.

Class Name :

35

CVPCLAccumReview

Data :**Member Functions :**

-60-

```
CVPCLAccumReview();  
EStatus InitializeTrans(TvPOSPParamsBlk *);  
EStatus ExecuteTrans(TvPOSResultsBlk *);  
EStatus ShutDownTrans();
```

5

Clear Accumulators Class (CVPCLClearAccum)

This class is derived from the CVPCLTransDataAdmin base class and implements the Accumulators Clear functionality.

10 **Class Name :****CVPCLClearAccum****Data :****Member Functions :**

```
CVPCLClearAccum();  
EStatus InitializeTrans(TvPOSPParamsBlk *);  
EStatus ExecuteTrans(TvPOSResultsBlk *);  
EStatus ShutDownTrans();
```

15

vPOS Configuration Data Administration Class (CVPCLConfigDataAdmin)

20 This is an abstract base class and is used to derive classes which implement the functionality for managing the vPOS configuration data. The class is derived from the CVPCLLocalTrans base class.

Class Name :25 **CVPCLConfigDataAdmin****Data :****Member Functions :**

Acquirer Data or the Host Definition Table Review Class (CVPCL_HDTRReview)

30 This class is derived from the CVPCLConfigDataAdmin class and implements the Host Definition Table Review functionality.

Class Name :**CVPCL_HDTRReview****Data :**35 **Member Functions :**

```
CVPCL_HDTRReview();  
EStatus InitializeTrans(TvPOSPParamsBlk *);
```

-61-

```
EStatus ExecuteTrans(TvPOSResultsBlk *);  
EStatus ShutDownTrans();
```

Issuer Data or the Card Definition Table Review Class (CVPCL_CDTReview)

5 This class is derived from the CVPCLConfigDataAdmin class and implements the Card Definition Table Review functionality.

Class Name :

CVPCL_CDTReview

Data :

10 **Member Functions :**

```
CVPCL_CDTReview();
```

```
EStatus InitializeTrans(TvPOSParamsBlk *);  
EStatus ExecuteTrans(TvPOSResultsBlk *);  
15 EStatus ShutDownTrans();
```

Communication Parameters Table Review Class (CVPCL_CPTReview)

This class is derived from the CVPCLConfigDataAdmin class and implements the Communications Parameters Table Review functionality.

20

Class Name :

CVPCL_CPTReview

Data :

25 **Member Functions :**

```
CVPCL_CPTReview();  
EStatus InitializeTrans(TvPOSParamsBlk *);  
EStatus ExecuteTrans(TvPOSResultsBlk *);  
EStatus ShutDownTrans();
```

30

Terminal Configuration Table Review Class (CVPCL_TCTReview)

This class is derived from the CVPCLConfigDataAdmin class and implements the Terminal Configuration Table Review functionality.

35 **Class Name :**

CVPCL_TCTReview

Data :

Member Functions :

CVPCL_TCTReview();

5 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

Acquirer Data or the Host Definition Table Update Class (CVPCL_HDTUpdate)

10 This class is derived from the CVPCLConfigDataAdmin class and implements the
Host Definition Table Update functionality.

Class Name :

CVPCL_HDTUpdate

Data :

15 **Member Functions :**
 CVPCL_HDTUpdate();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();
20

Issuer Data or the Card Definition Table Update Class (CVPCL_CDTUpdate)

This class is derived from the CVPCLConfigDataAdmin class and implements the
Card Definition Table Update functionality.

Class Name :

25 **CVPCL_CDTUpdate**

Data :**Member Functions :**

 CVPCL_CDTUpdate();
 EStatus InitializeTrans(TvPOSPParamsBlk *);
30 EStatus ExecuteTrans(TvPOSResultsBlk *);
 EStatus ShutDownTrans();

vPOS API Definition

35 This section explains in the vPOS API which are required for interfacing with the
vPOS Class Library. All the different vPOS transactions can be initiated using the
API defined in this section.

vPOSInitialize - Initialize vPOS

This API is used to start and initialize the vPOS. The API definition is disclosed below.

API Definition :

vPOSBool vPOSInitialize(void);

5 **Parameters :**

None

Returns :

TRUE or FALSE indicating whether the function call was a success.

10 **vPOSExecute - Execute a vPOS Transaction**

This API is used to execute a particular vPOS transaction.

API Definition :

vPOSBool vPOSExecute(TvPOSParamsBlk *, TvPOSResultsBlk *)

Parameters :

15 Pointer to the Parameters Structure (TvPOSParamsBlk)

Pointer to the Results Structure (TvPOSResultsBlk)

Returns :

TRUE or FALSE indicating whether the function call was a success.

20 **vPOSShutDown - Shutdown the vPOS**

This is used to shutdown the vPOS.

API Definition :

vPOSBool vPOSShutDown(void)

Parameters :

25 None

Returns :

TRUE or FALSE indicating whether the function call was a success.

vPOS Status Codes

30 This section details the different status codes (listed under the enumeration EStatus) which the vPOS returns for the different operations performed.

enum EStatus

```
{
    eSuccess = 0,           // Function call or operation successful
    eFailure,              // General failure
    evPOSLocked,           // vPOS locked, transaction not allowed
    // Transaction related error codes
}
```

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	ePmtInstNotSupported,	// Payment Instrument not supported
	eTransNotSupported,	// Transaction type not supported
	eTransInitErr,	// Transaction Initialization Failed
	eAdjustNotAllwd,	// Adjust not allowed on this transaction
5	eVoidNotAllwd,	// Void not allowed on this transaction
	eForcedPostNotAllwd,	// Forced Post not allowed on this transaction
	ePreAuthCompNotAllwd,	// Pre-Auth. not allowed on this transaction
	eAmtErr,	// Error in the amount passed
	eHDTLoadErr,	// Error during loading the HDT table
10	eCDTLoadErr,	// Error during loading the CDT table
	eCPTLoadErr,	// Error during loading the CPT table
	eTCTLoadErr,	// Error during loading the TCT table
	eHDTWriteErr,	// Error during writing to the HDT table
	eCDTWriteErr,	// Error during writing to the CDT table
15	eCPTWriteErr,	// Error during writing to the CPT table
	eTCTWriteErr,	// Error during writing to the TCT table
	eTCTFieldErr,	// Error handling a TCT table field
	eLuhnErr,	// Luhn check failed on the account
	eRangingErr,	// Card range not found
20	ePANLenErr,	// PAN length error
	eExpiredCard,	// Card expired
	eInvalidMonth,	// Invalid month in the expiration date
	eFileOpenErr,	// General file open error
	eFileCloseErr,	// General file close error
25		

vPOS Terminal Architecture

Figure 25 is a block diagram of the vPOS Terminal Architecture in accordance with a preferred embodiment. The Internet 2500 provides the communication processing necessary to enable the vPOS Terminal architecture. The terminal interface CGI 2520 communicates via the Internet to provide information to the vPOS OLE Server 2550 which formats information in accordance with the vPOS API DLL 2560 which uses the protocol class DLL 2570 to flesh out the message for delivery to the Gateway Server 2580. The collection of the vPOS OLE Server 2550, vPOS API DLL 2560 and the Protocol Class DLL 2570 make up the vPOS Software Development Toolkit (SDK) which are used to enable vPOS applications for interfacing with an Operator 2540.

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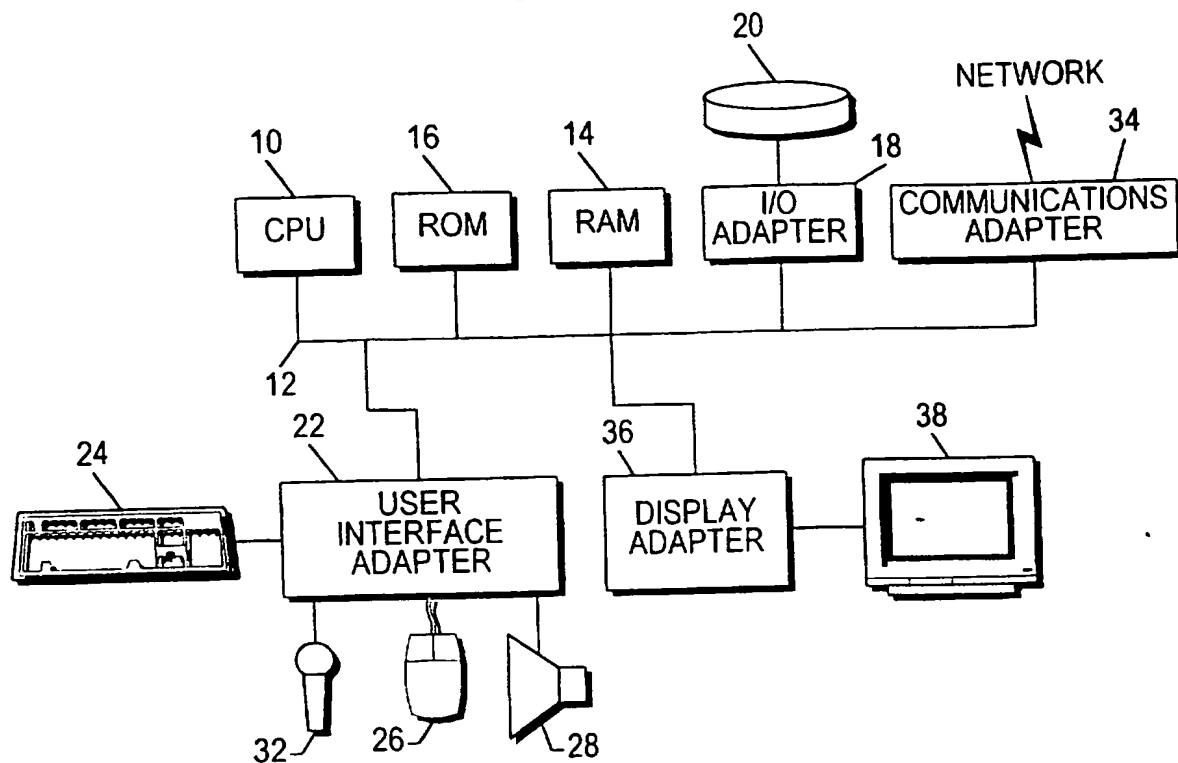


FIG.-1A

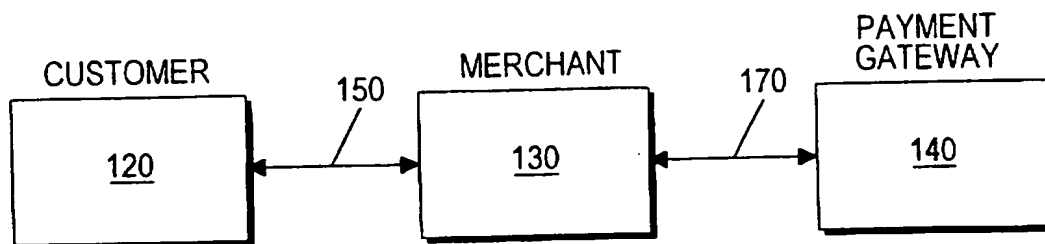


FIG.-1B

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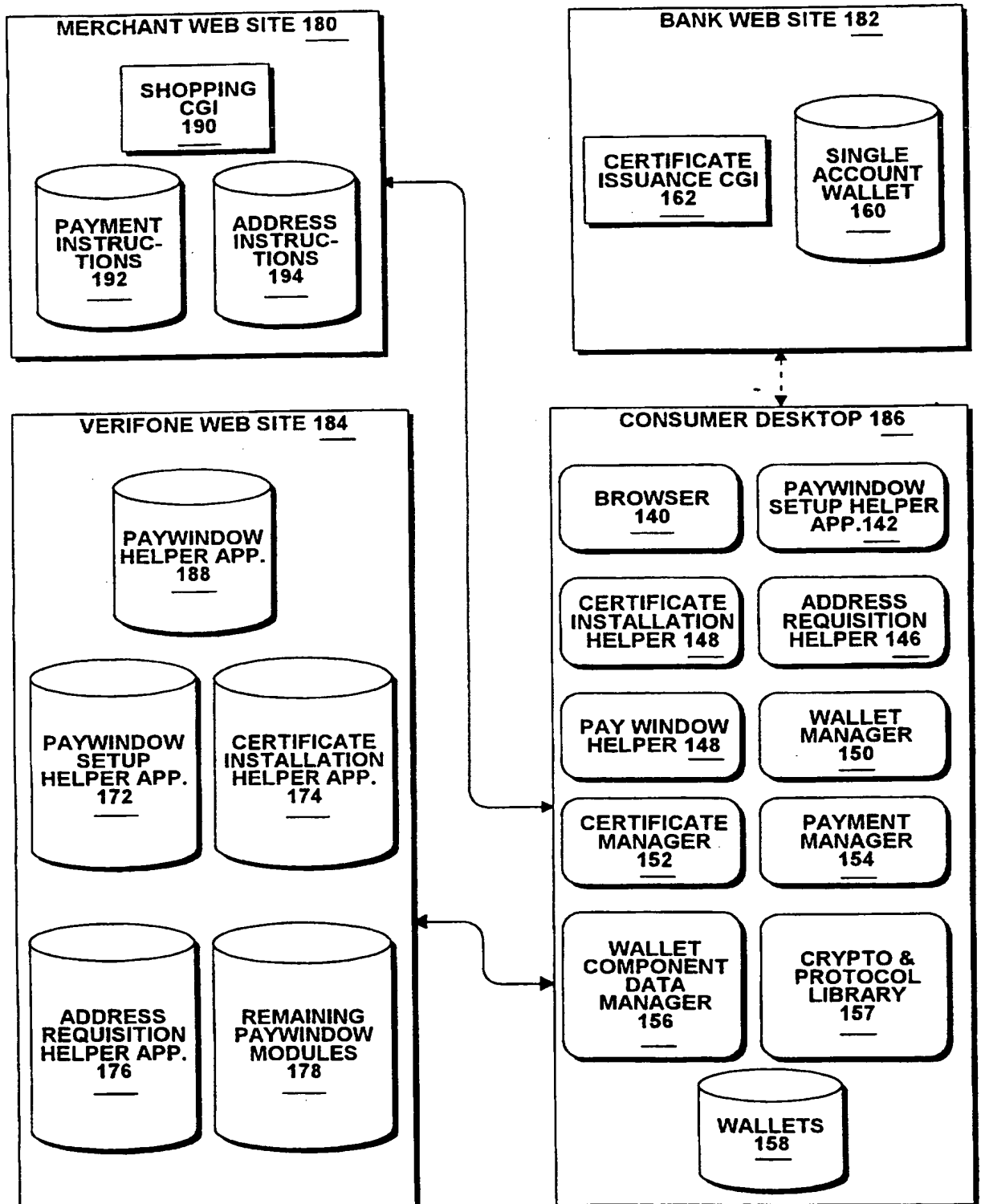
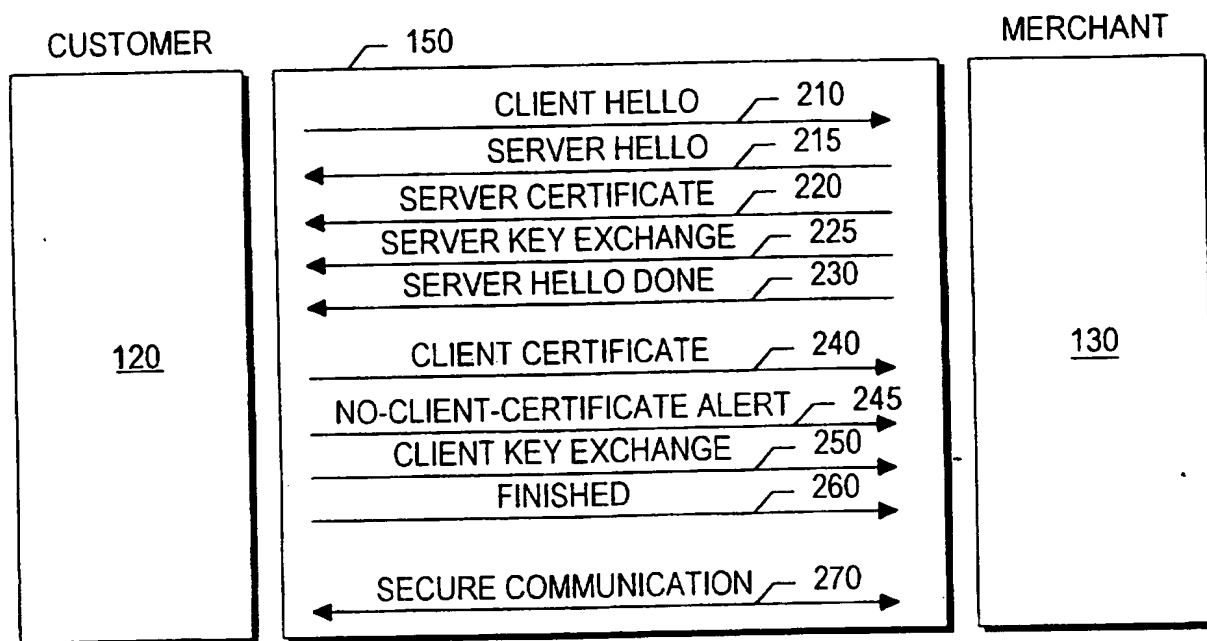
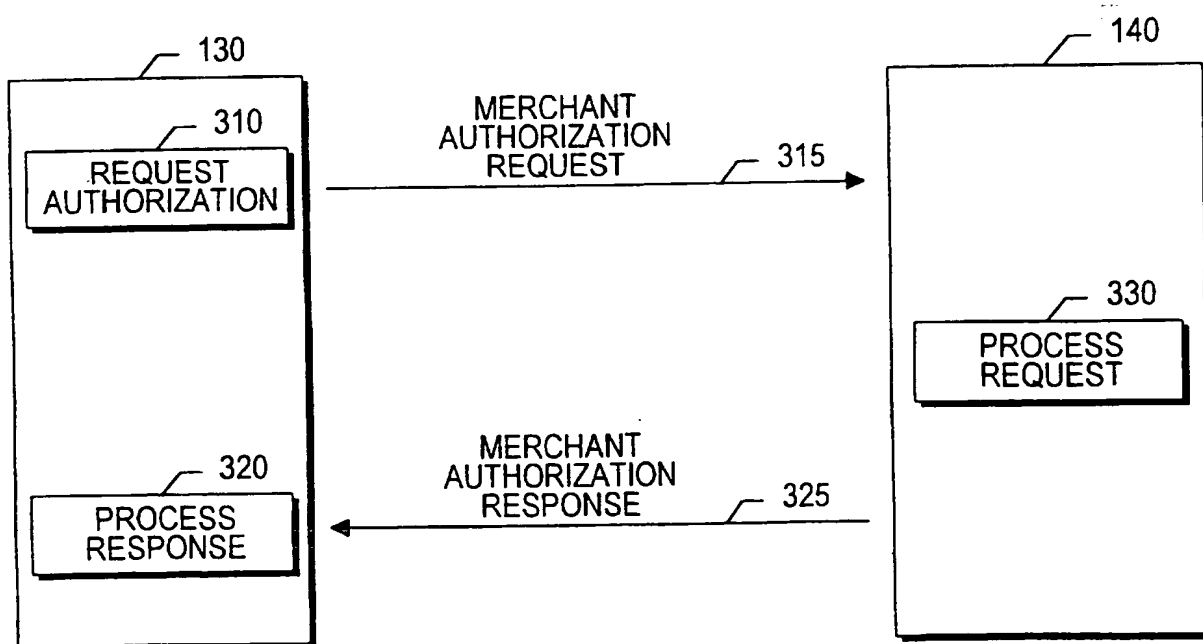


FIG.-1C

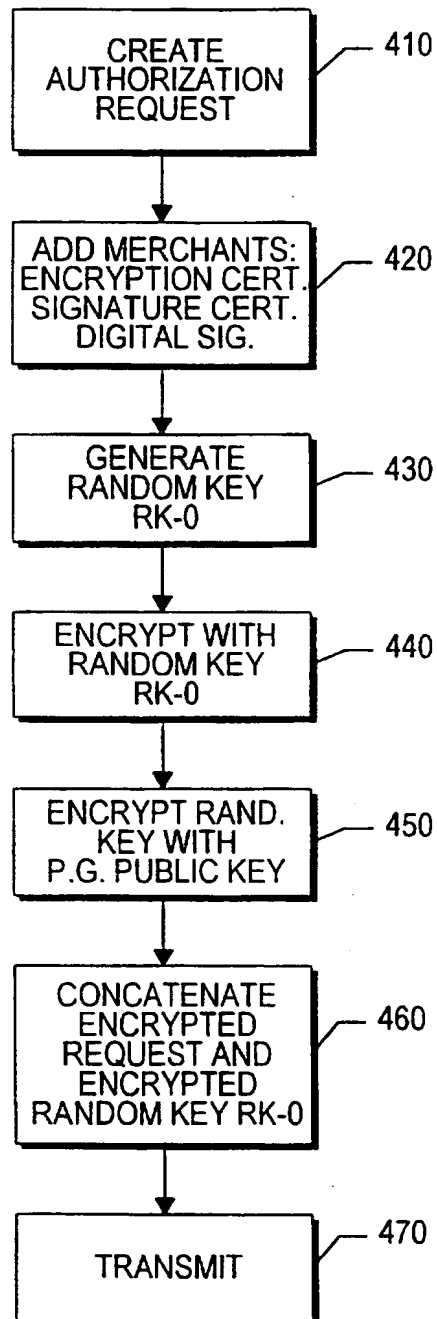
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**FIG.-2****FIG.-3**

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**FIG.-4**

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FIG.-5A

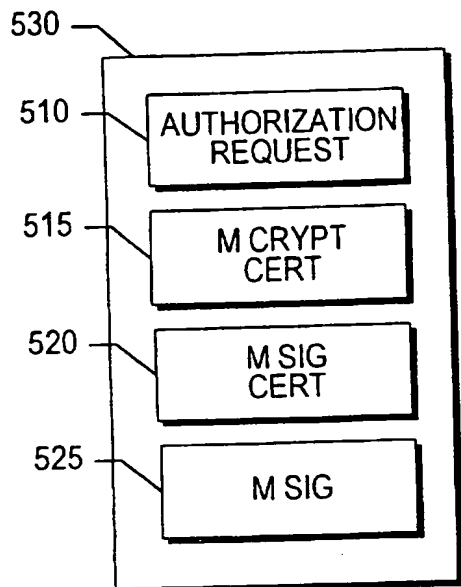


FIG.-5B

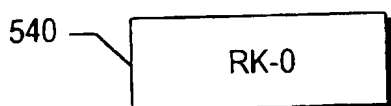


FIG.-5C

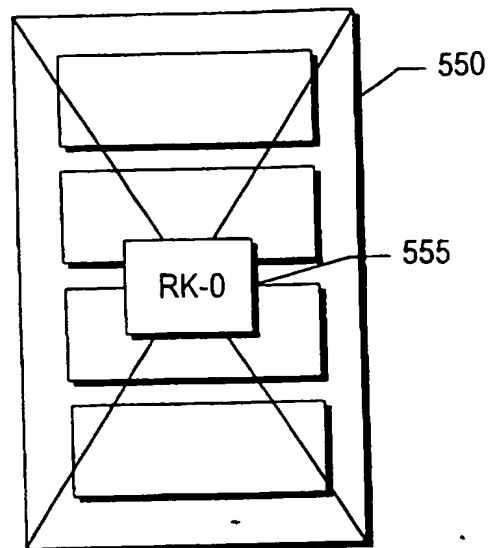


FIG.-5D

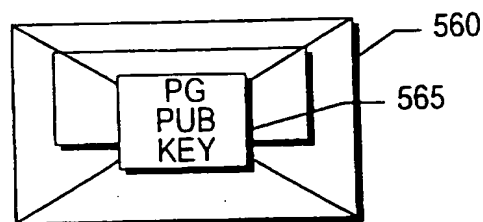


FIG.-5E

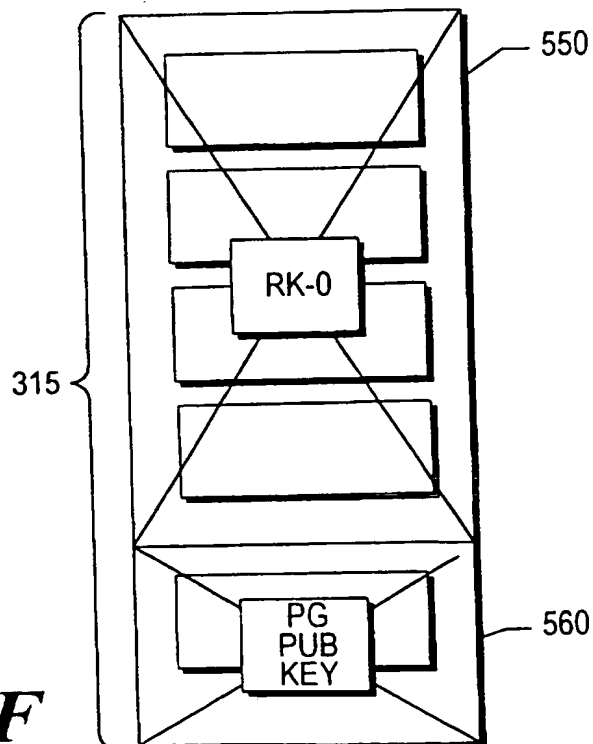
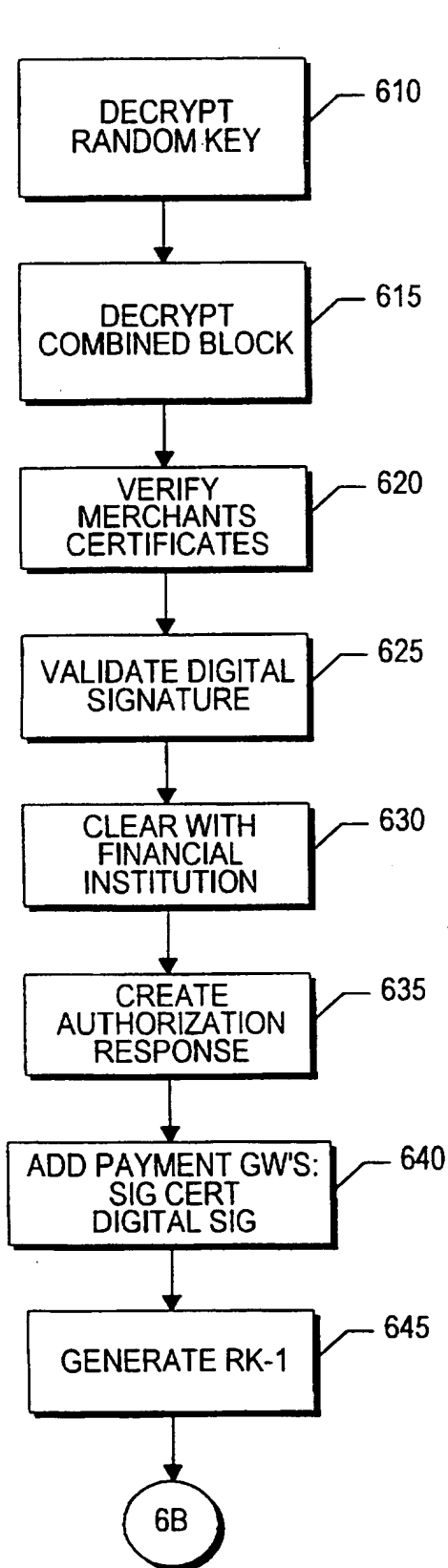
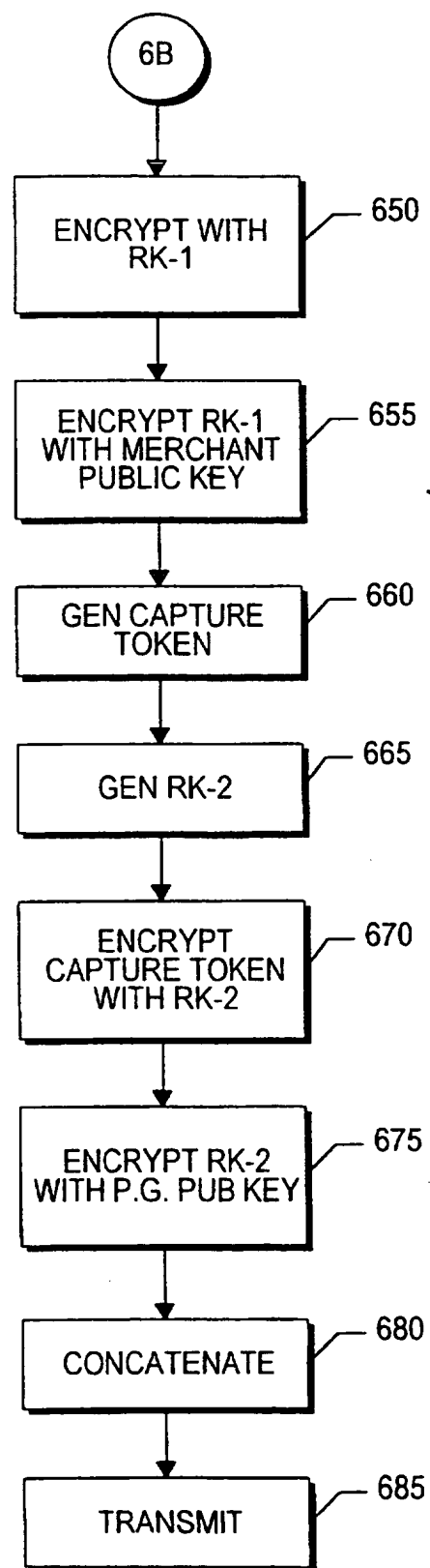


FIG.-5F

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**FIG.-6A****FIG.-6B**

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FIG.-7A

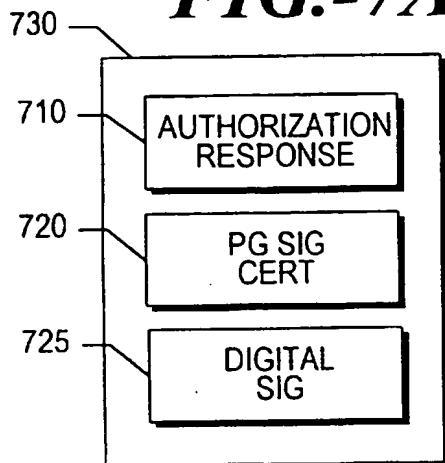


FIG.-7B

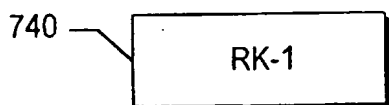


FIG.-7C

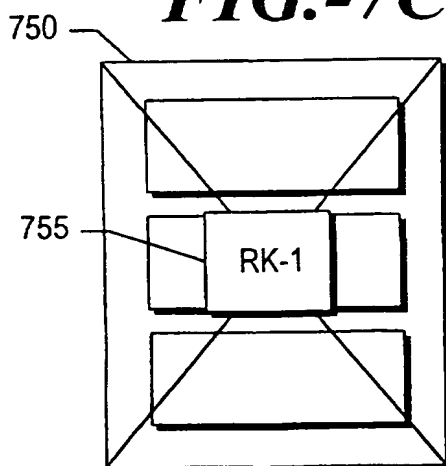


FIG.-7D

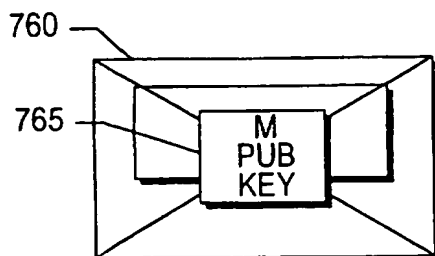


FIG.-7E



FIG.-7F



FIG.-7G

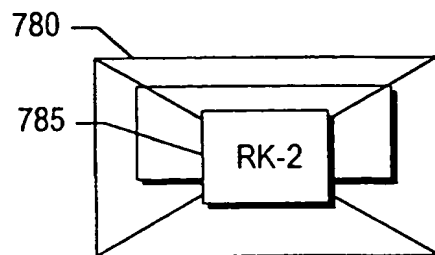


FIG.-7H

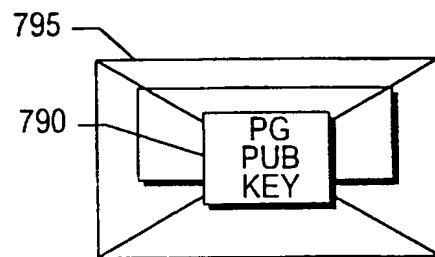


FIG.-7I

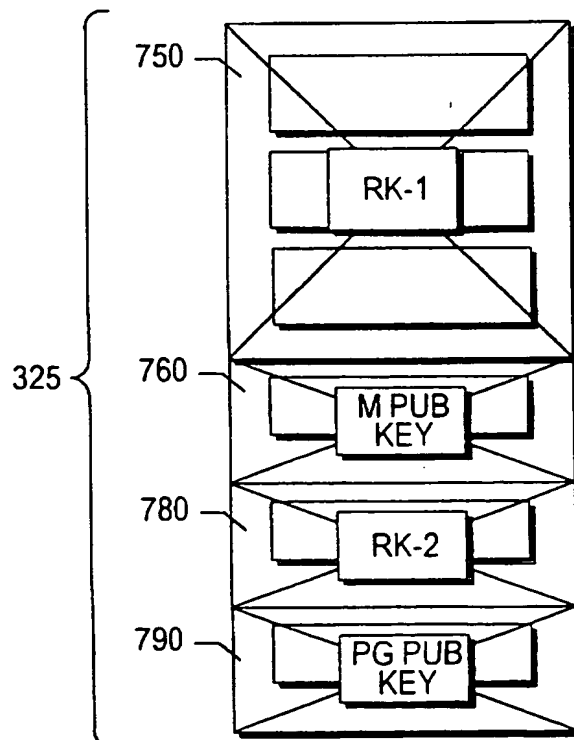
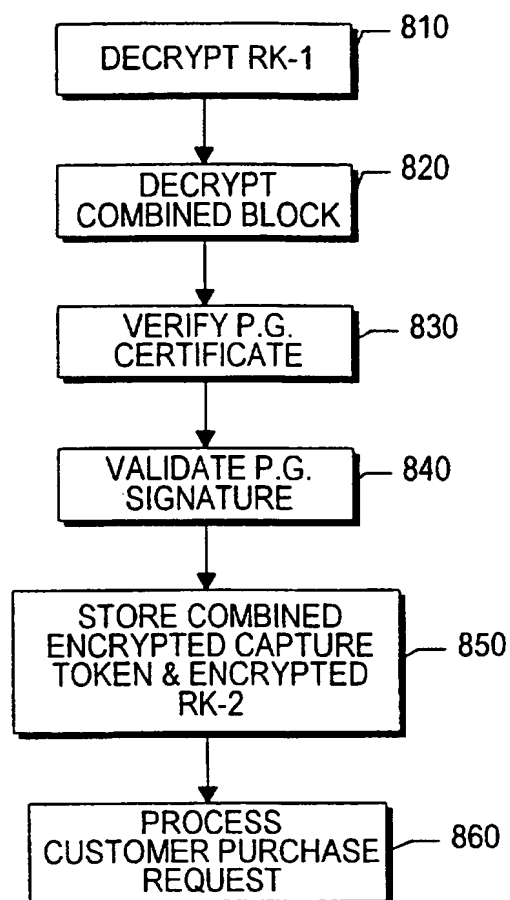
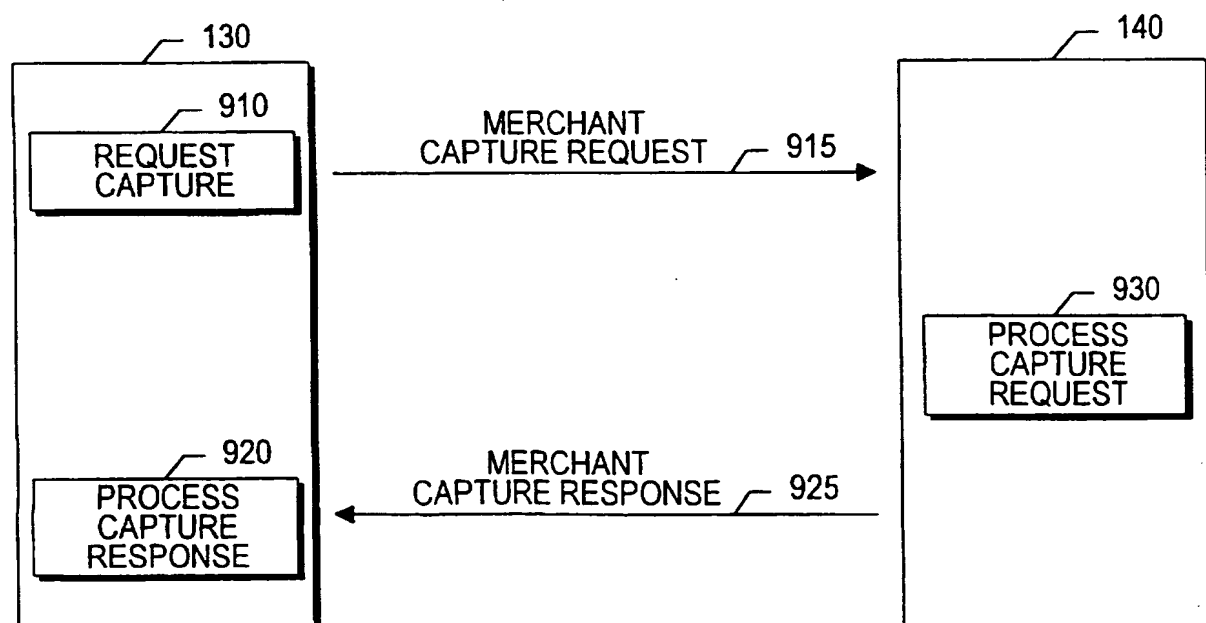


FIG.-7J

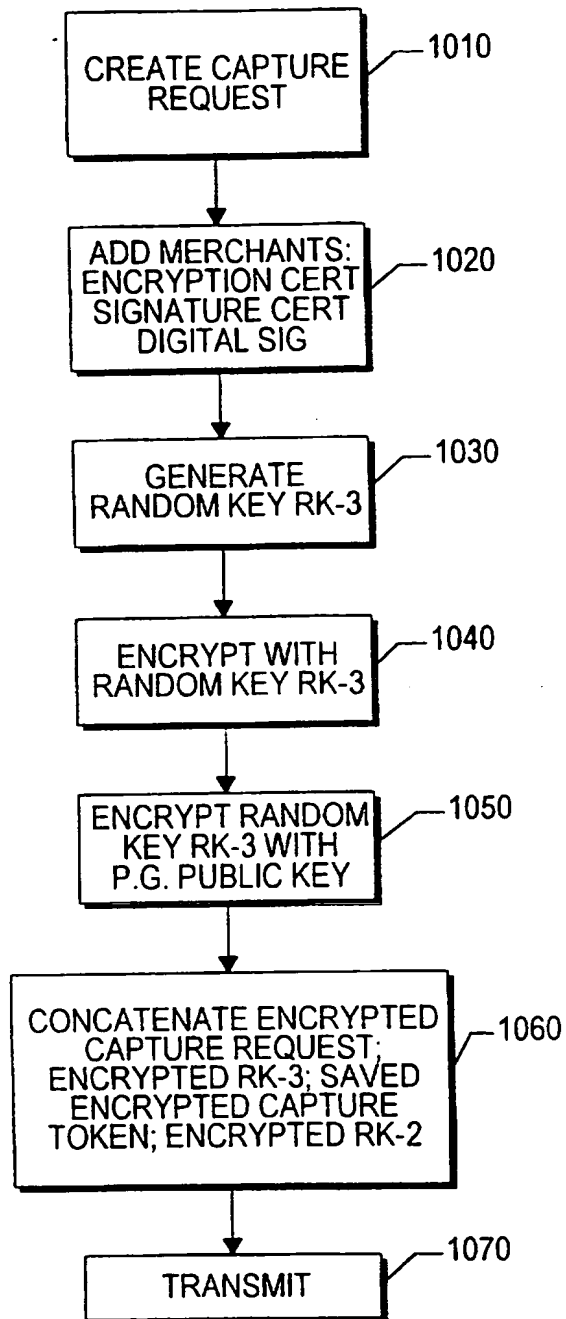
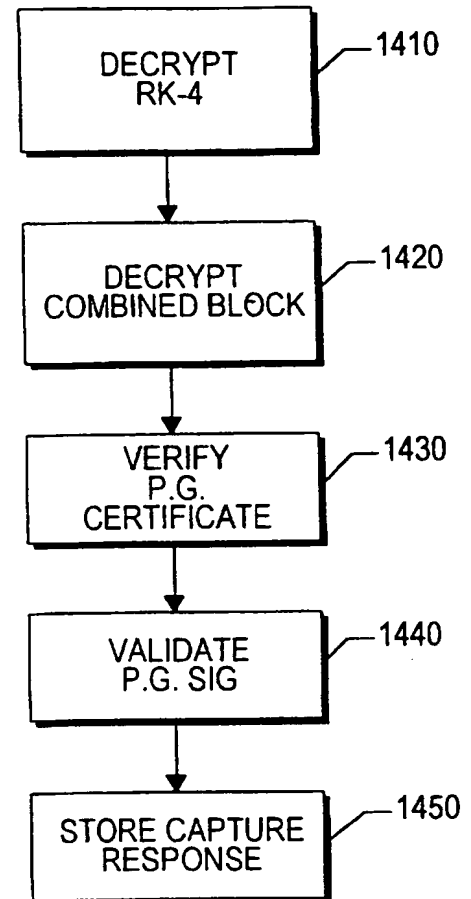
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**FIG.-8****FIG.-9**

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**FIG.-10****FIG.-14**

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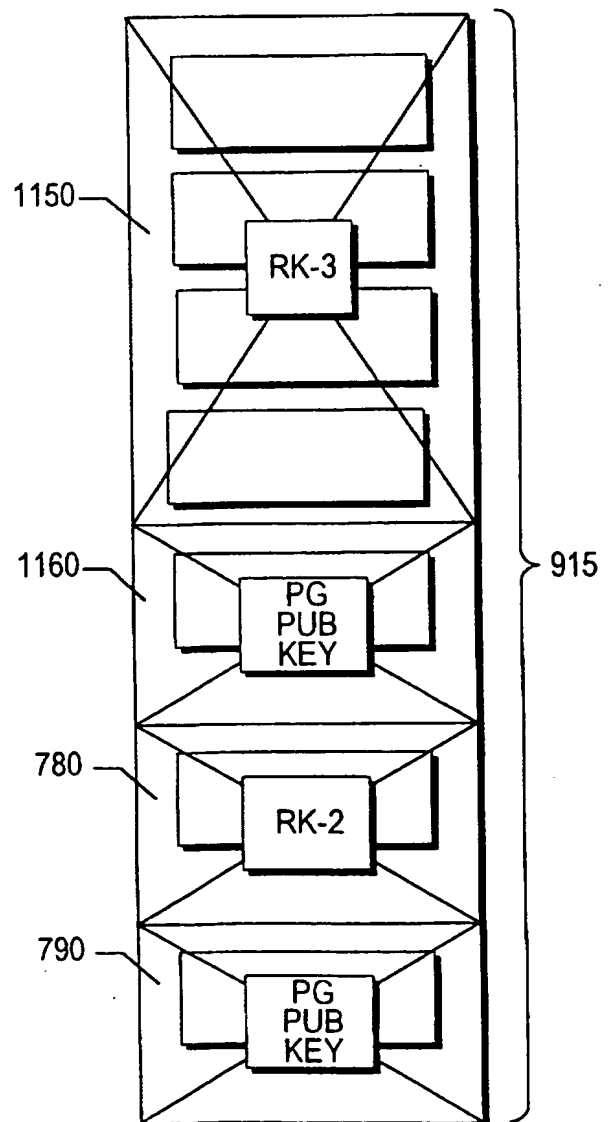
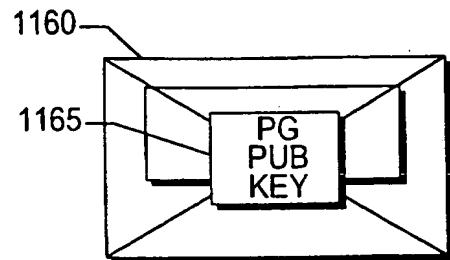
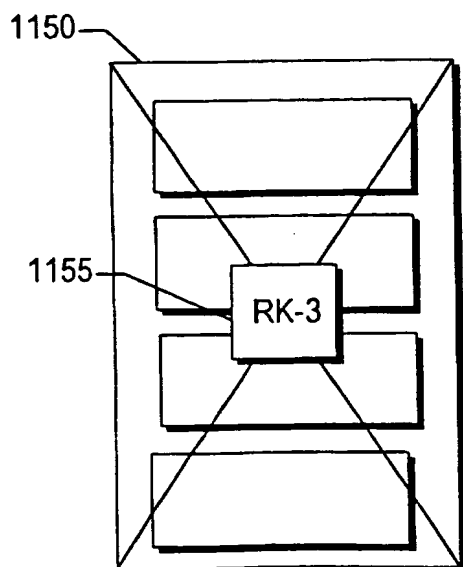
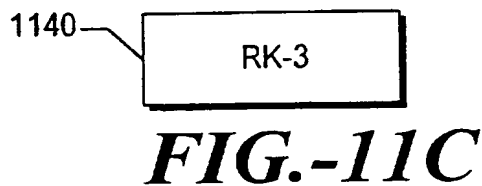
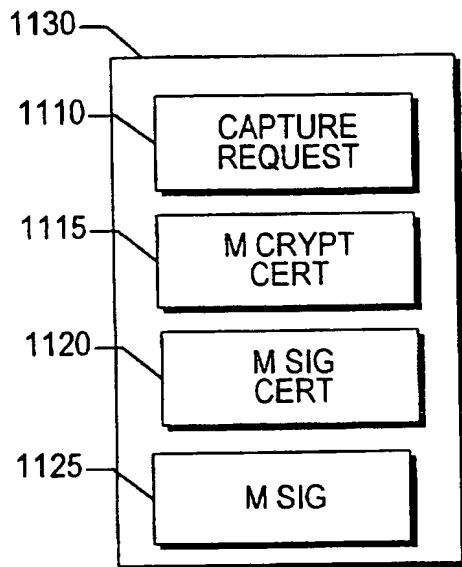
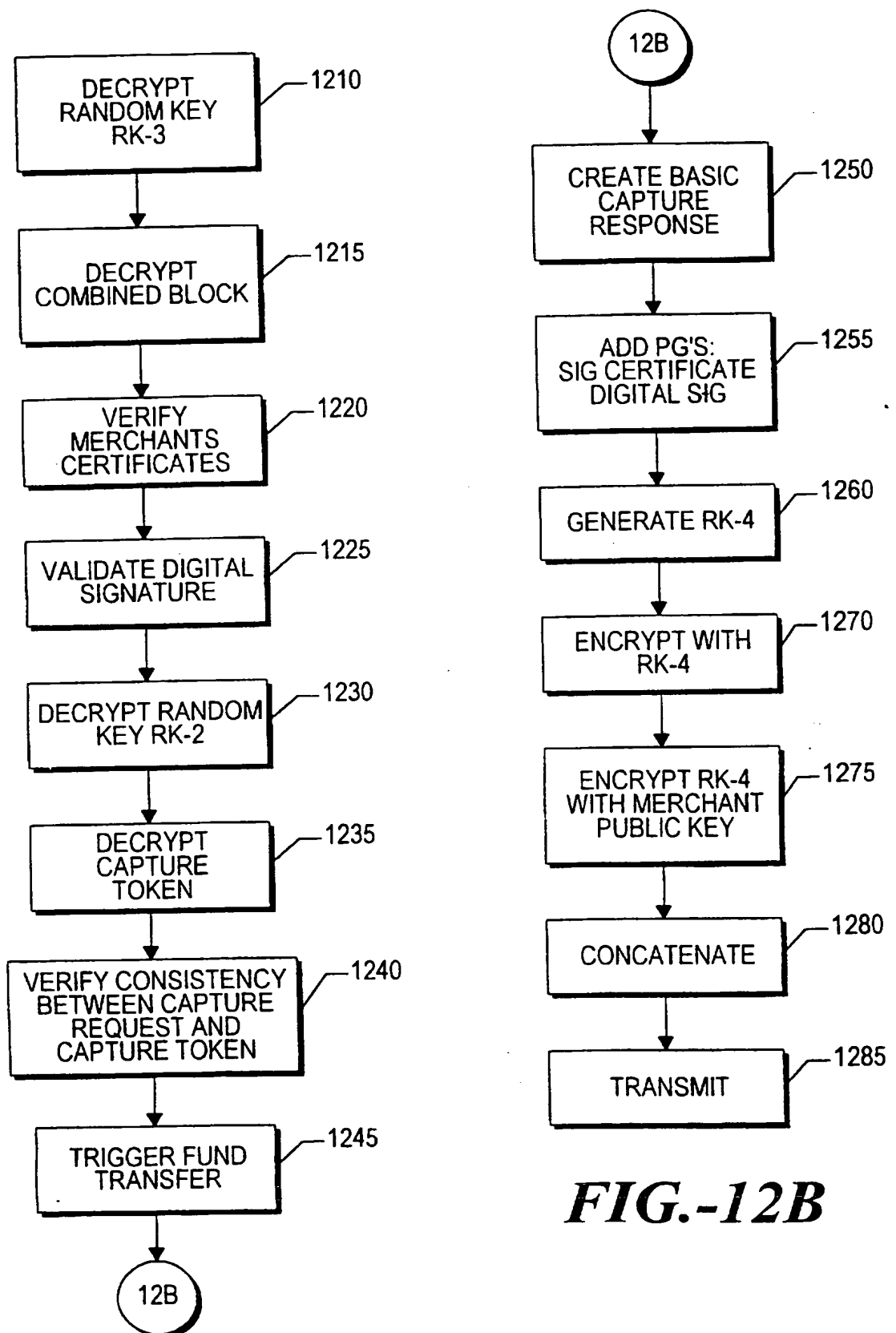


FIG.-11D

FIG.-11F

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**FIG.-12B****FIG.-12A**

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FIG.-13A

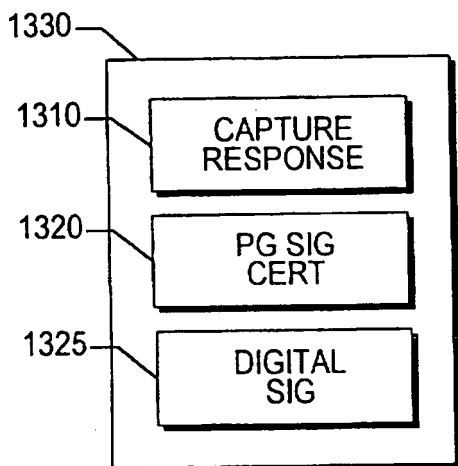


FIG.-13B

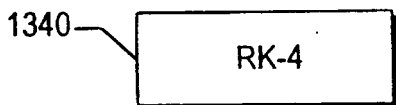


FIG.-13C

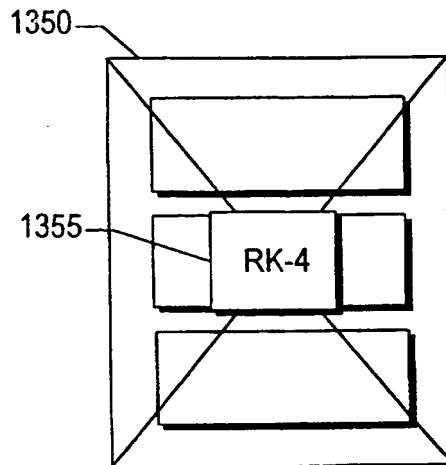


FIG.-13D

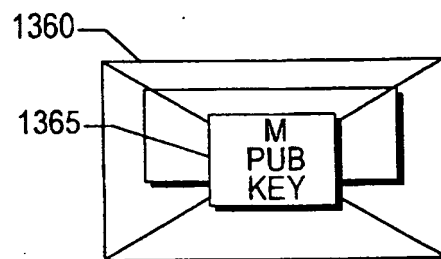


FIG.-13E

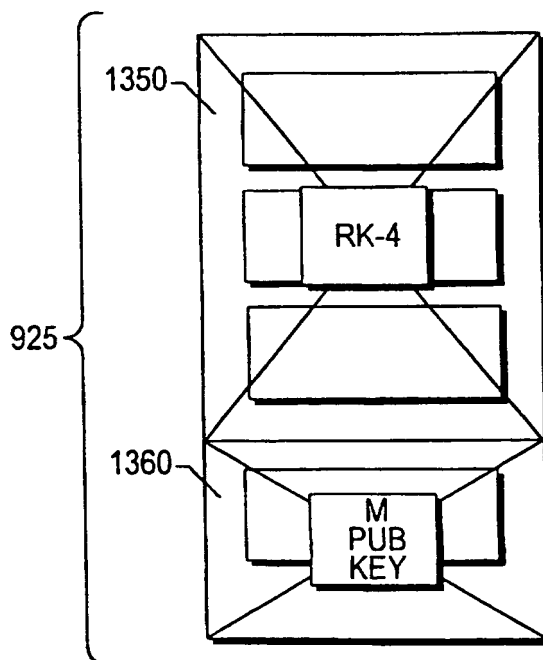
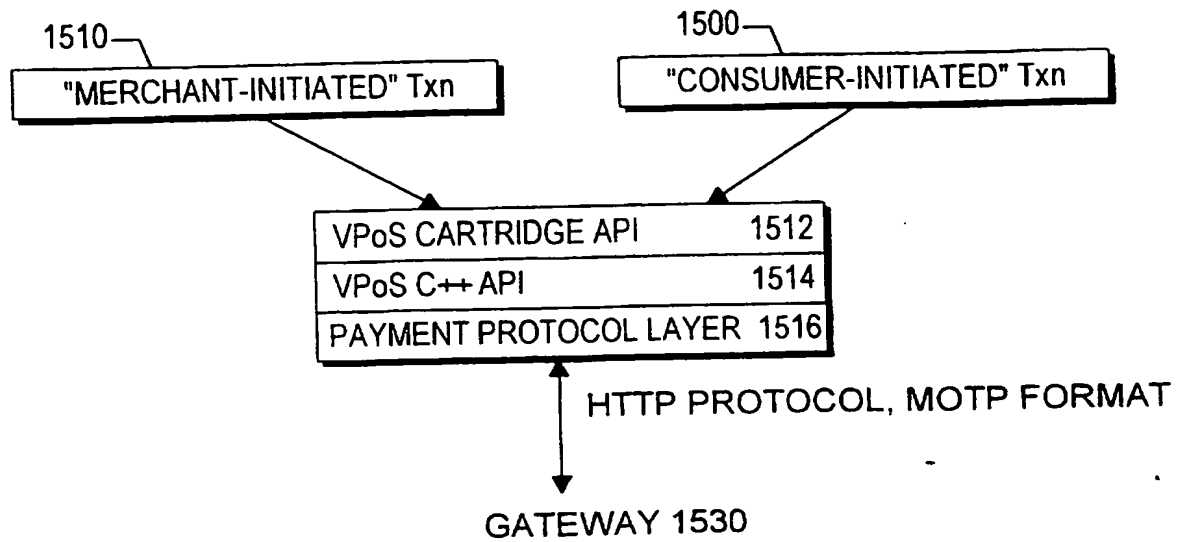
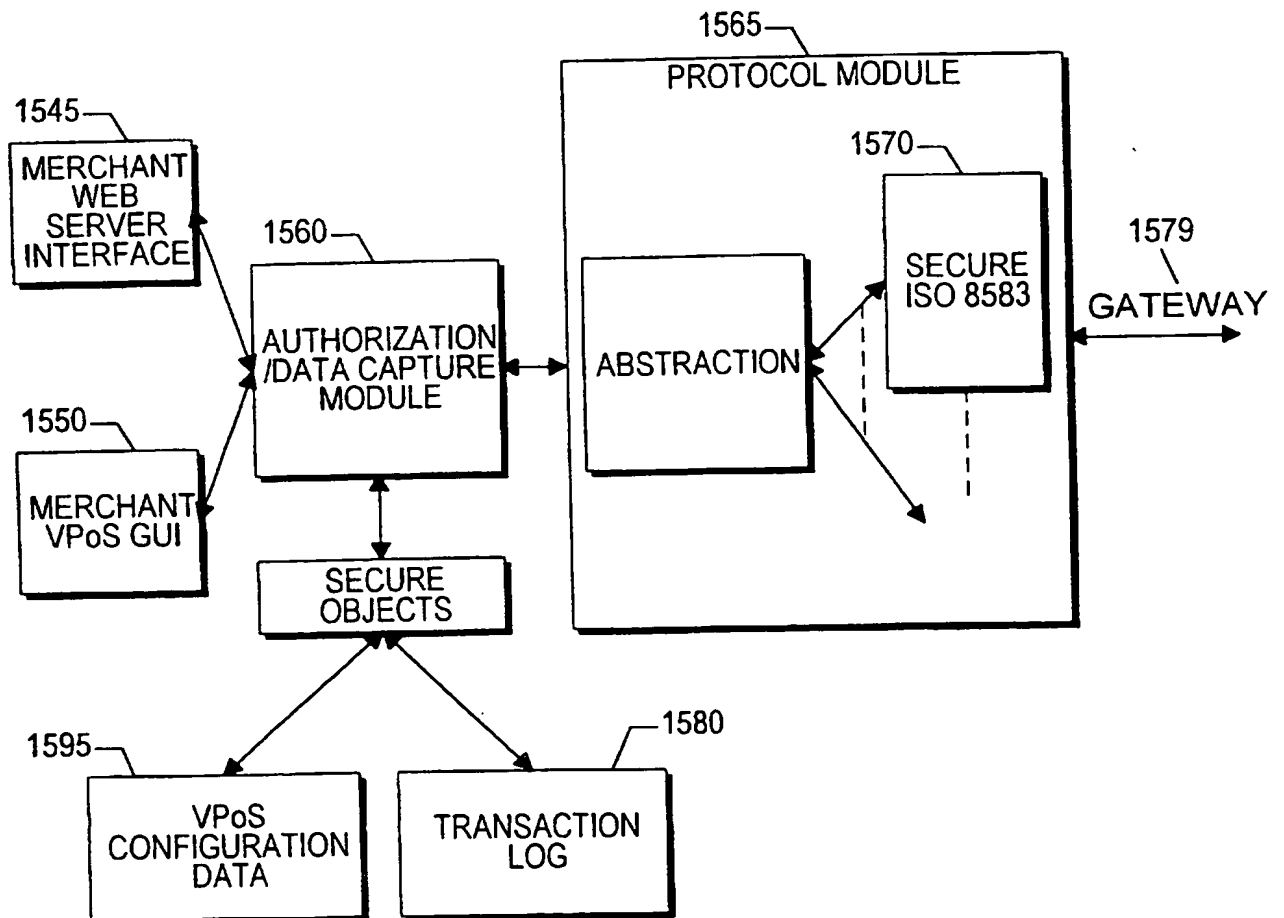


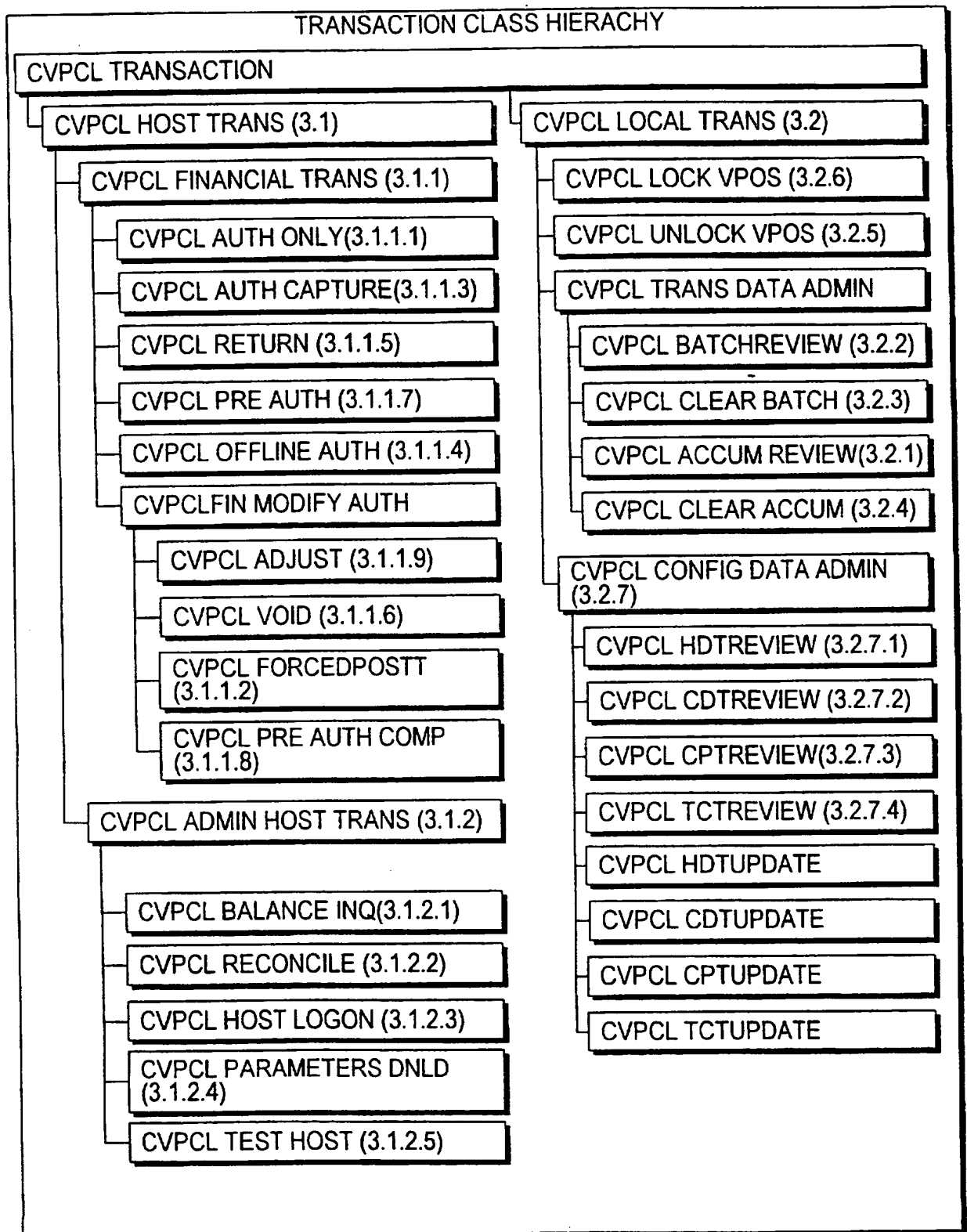
FIG.-13F

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**FIG.-15A****FIG.-15B**

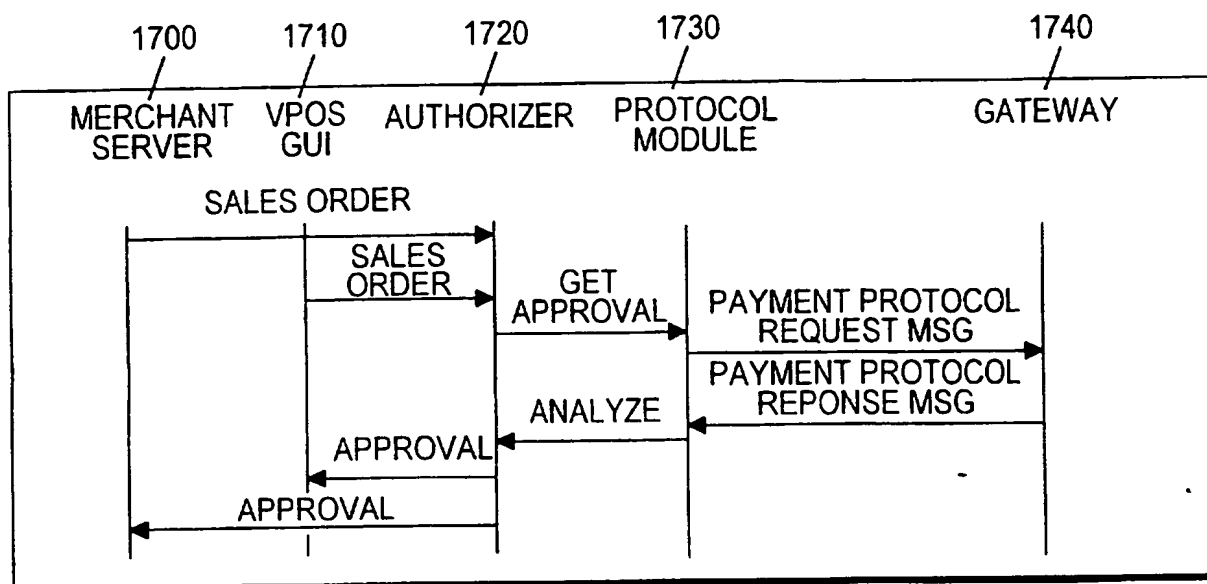
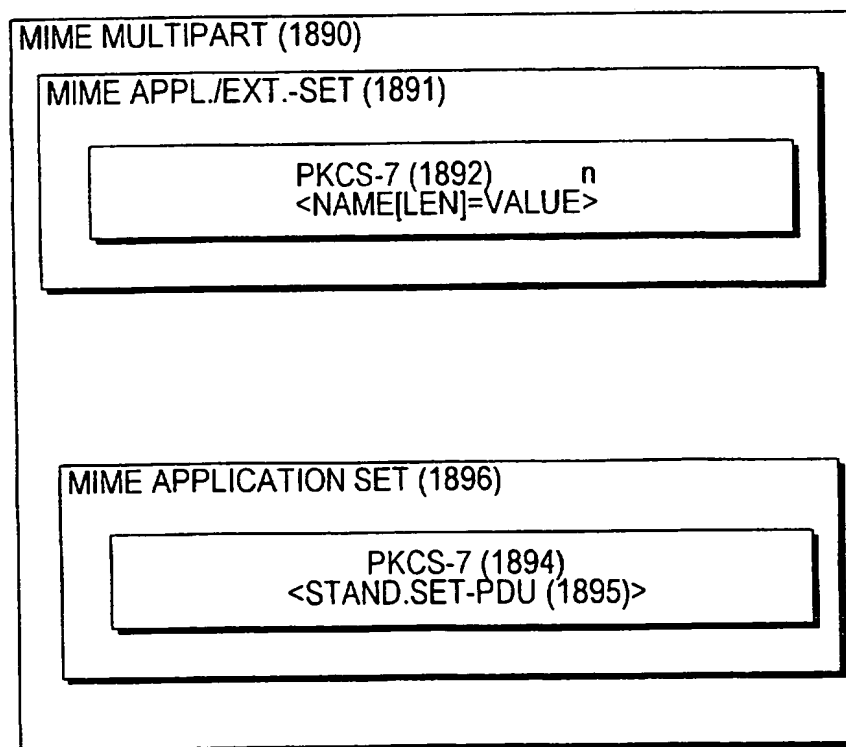
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**FIG.-16**

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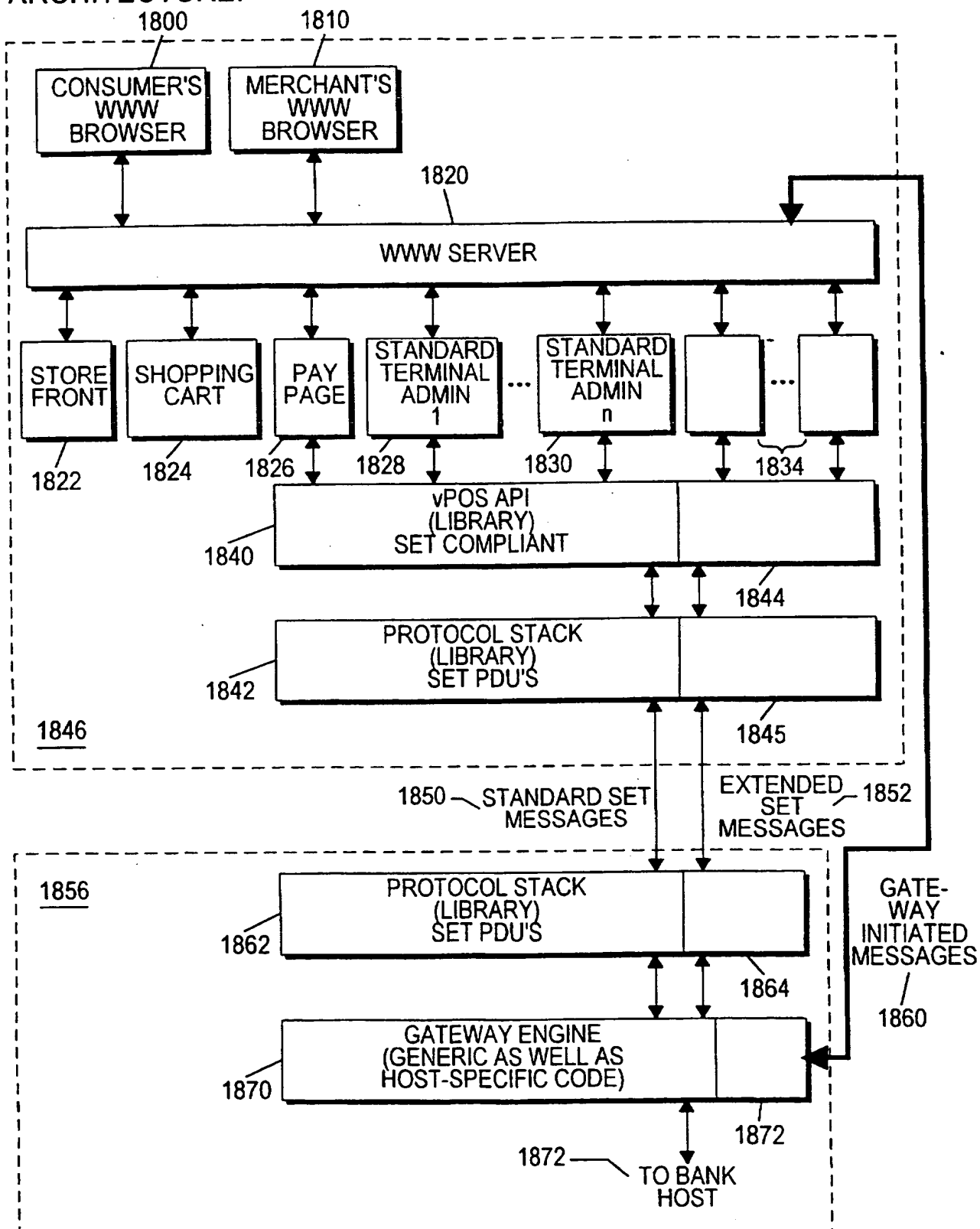
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**FIG.-17****FIG.-18B**

SUBSTITUTE SHEET (RULE 26)

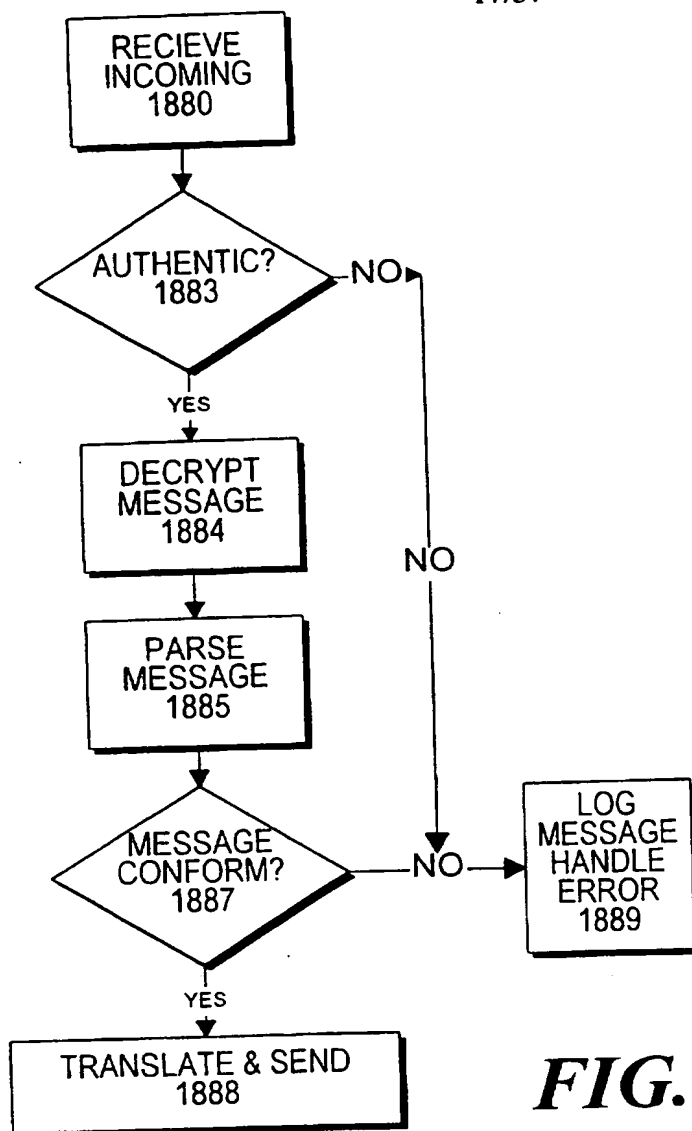
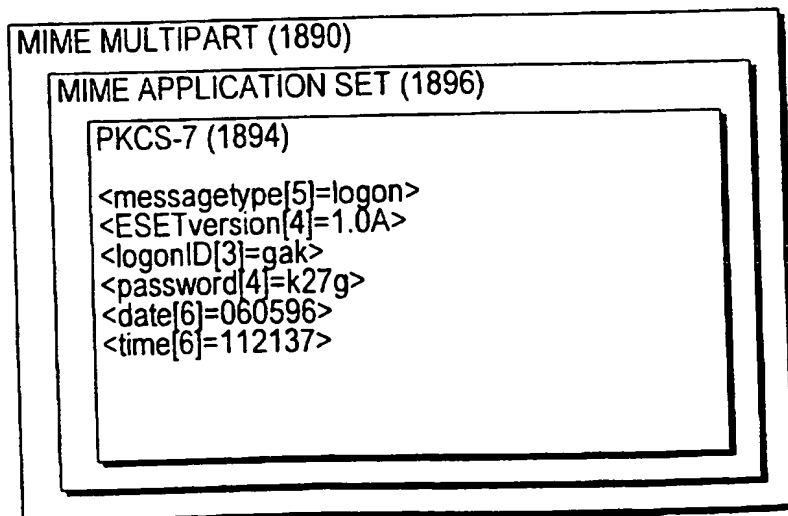
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ARCHITECTURE:

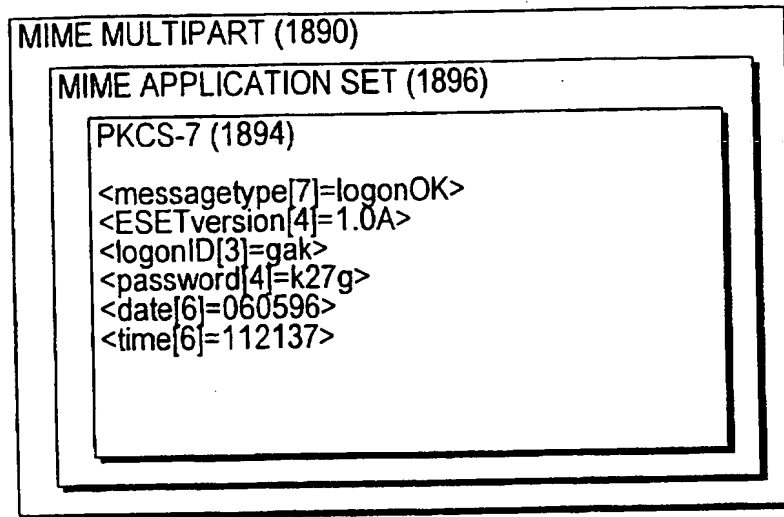
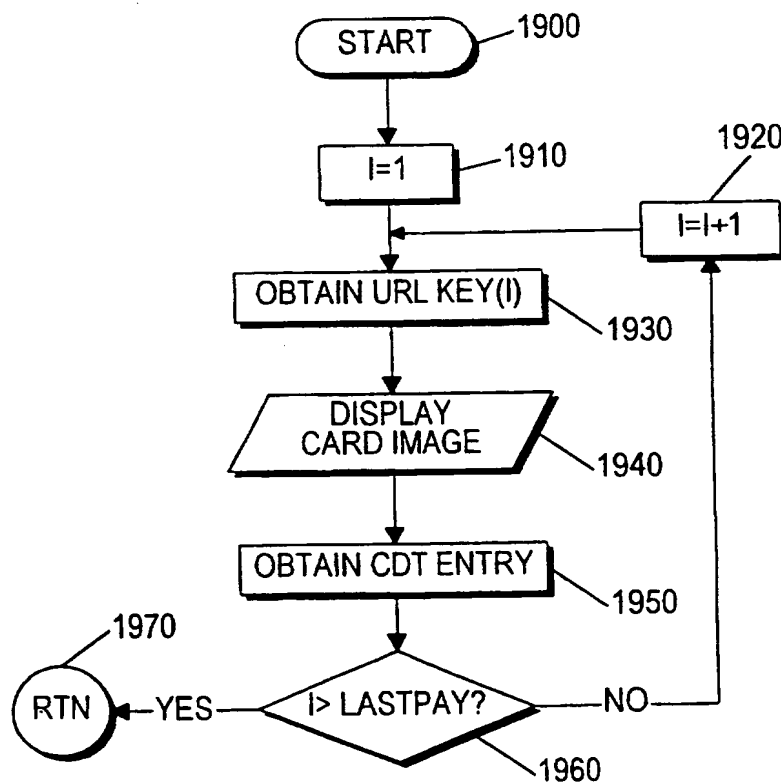
**FIG.-18A**

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**FIG.-18C****FIG.-18D**

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**FIG.-18E****FIG.-19**

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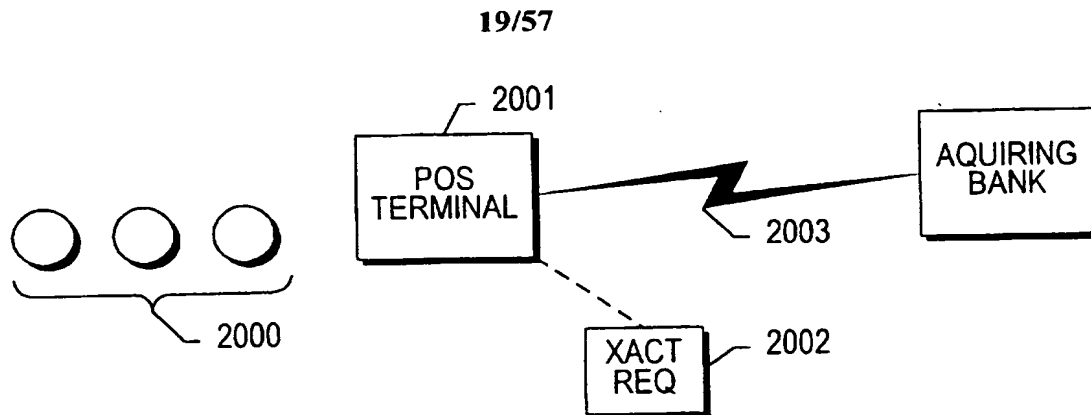


FIG.-20A

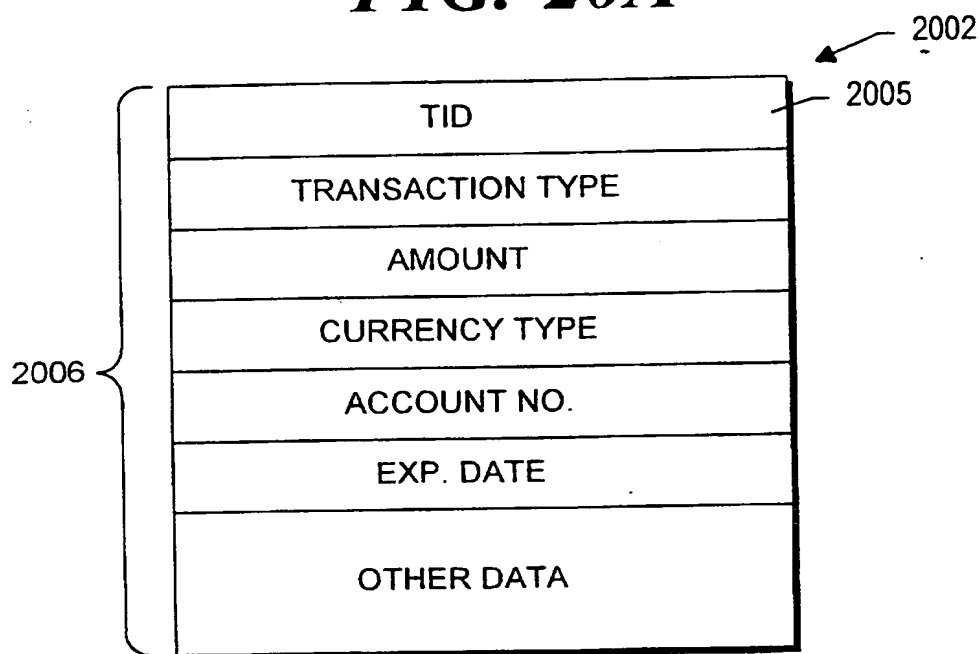


FIG.-20B

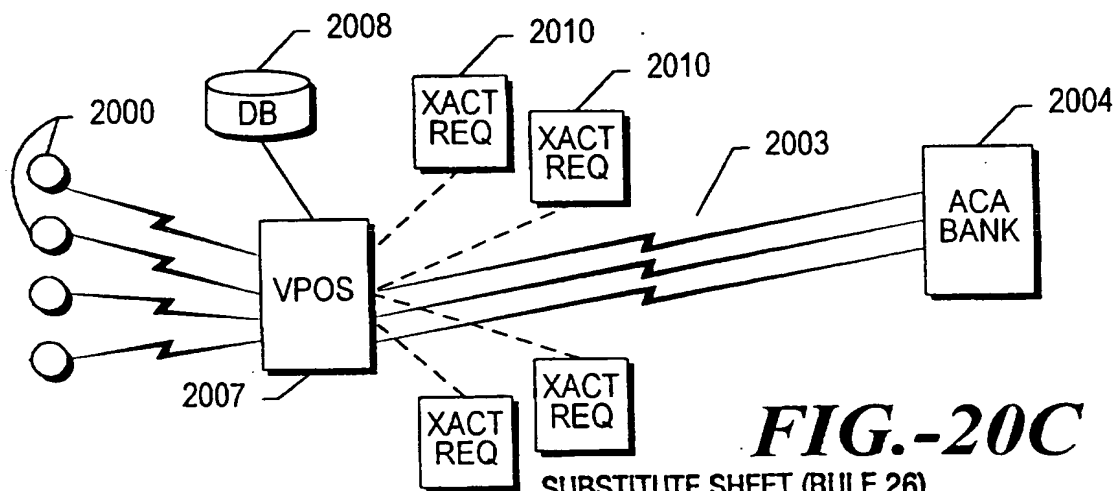
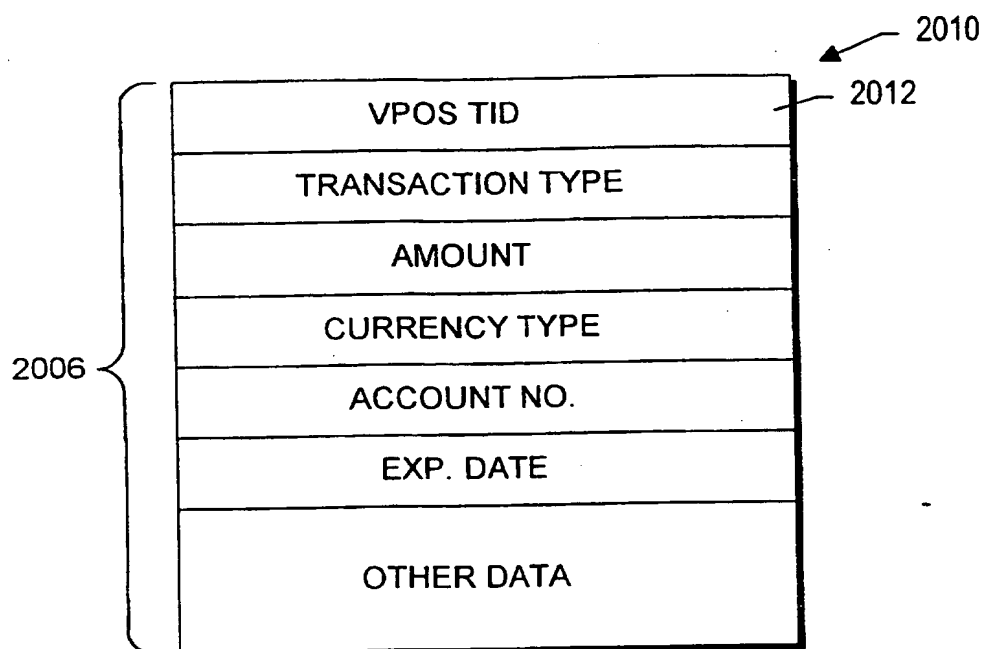
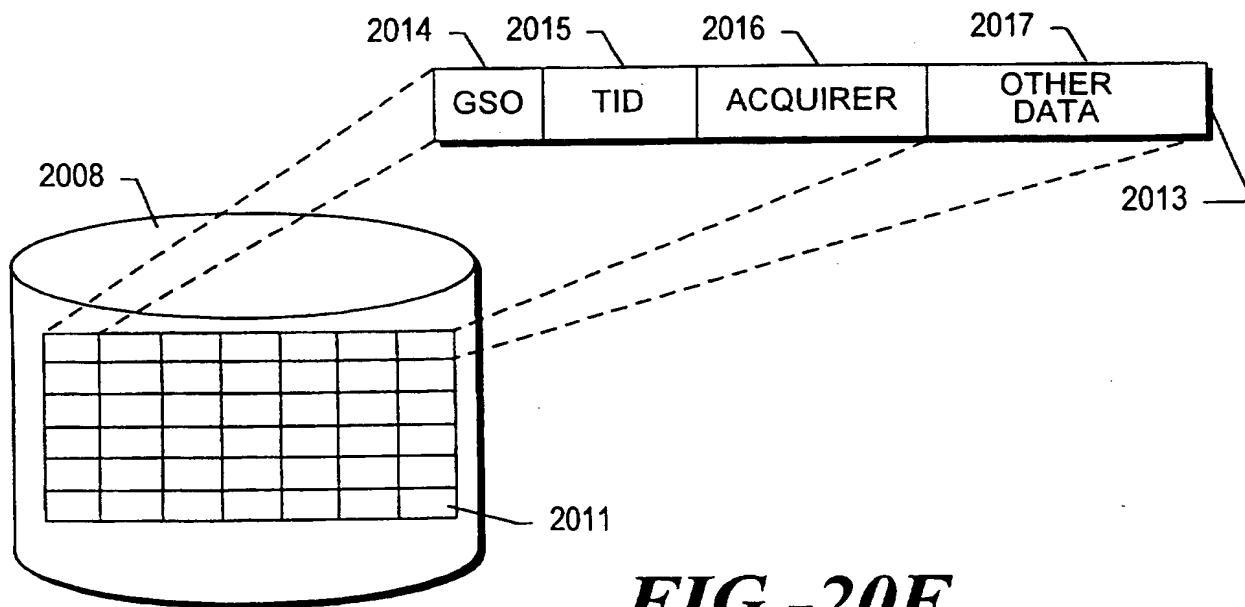


FIG.-20C

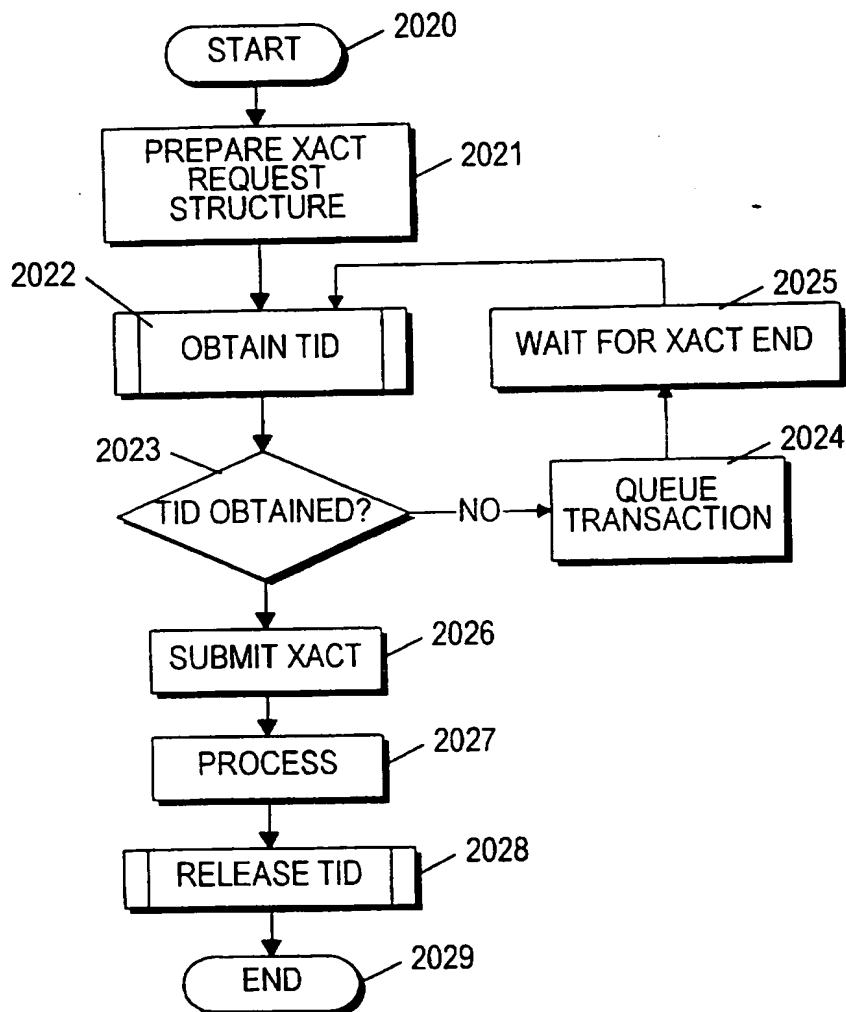
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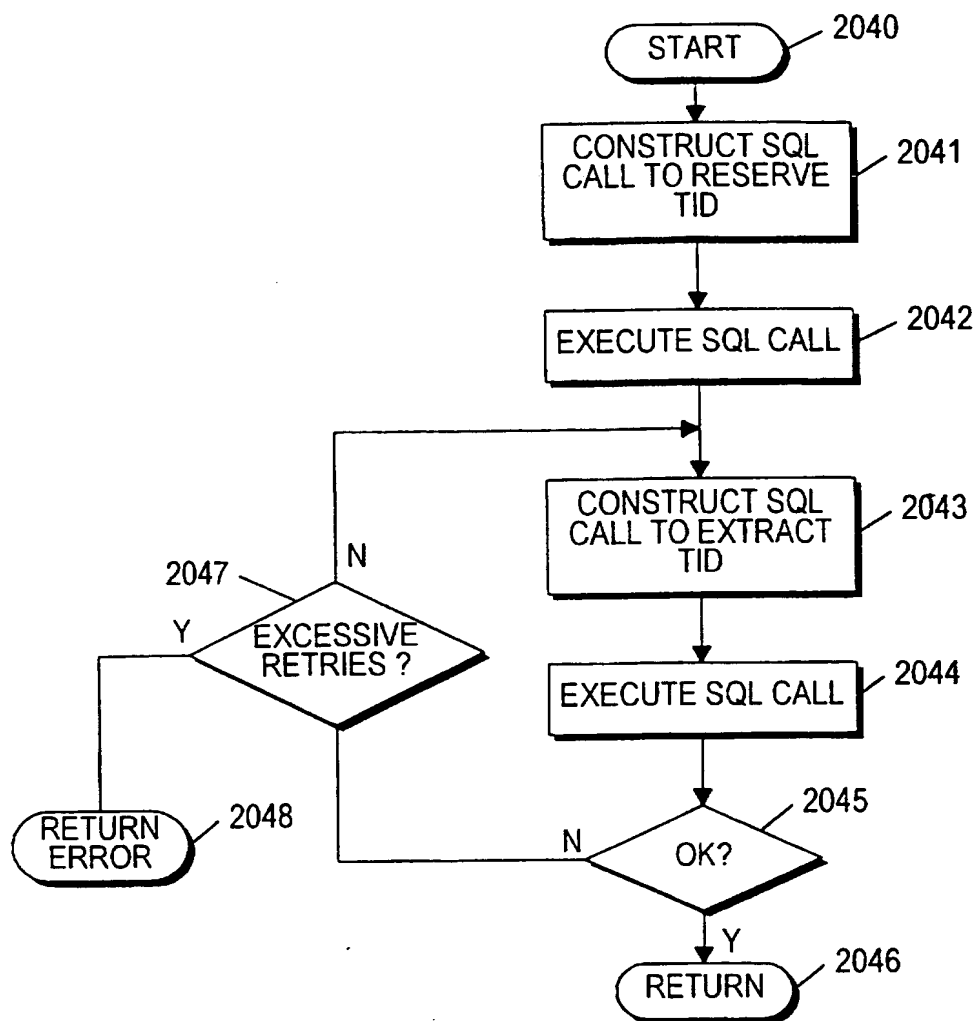
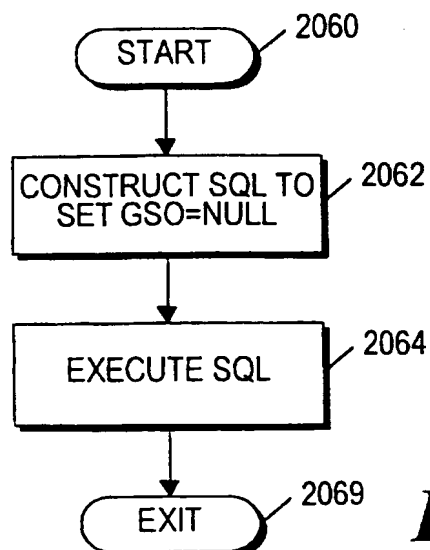
**FIG.-20D****FIG.-20E**

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OVERVIEW USING TID
OBTAIN & RELEASE**FIG.-20F**

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**FIG.-20G****FIG.-20H**

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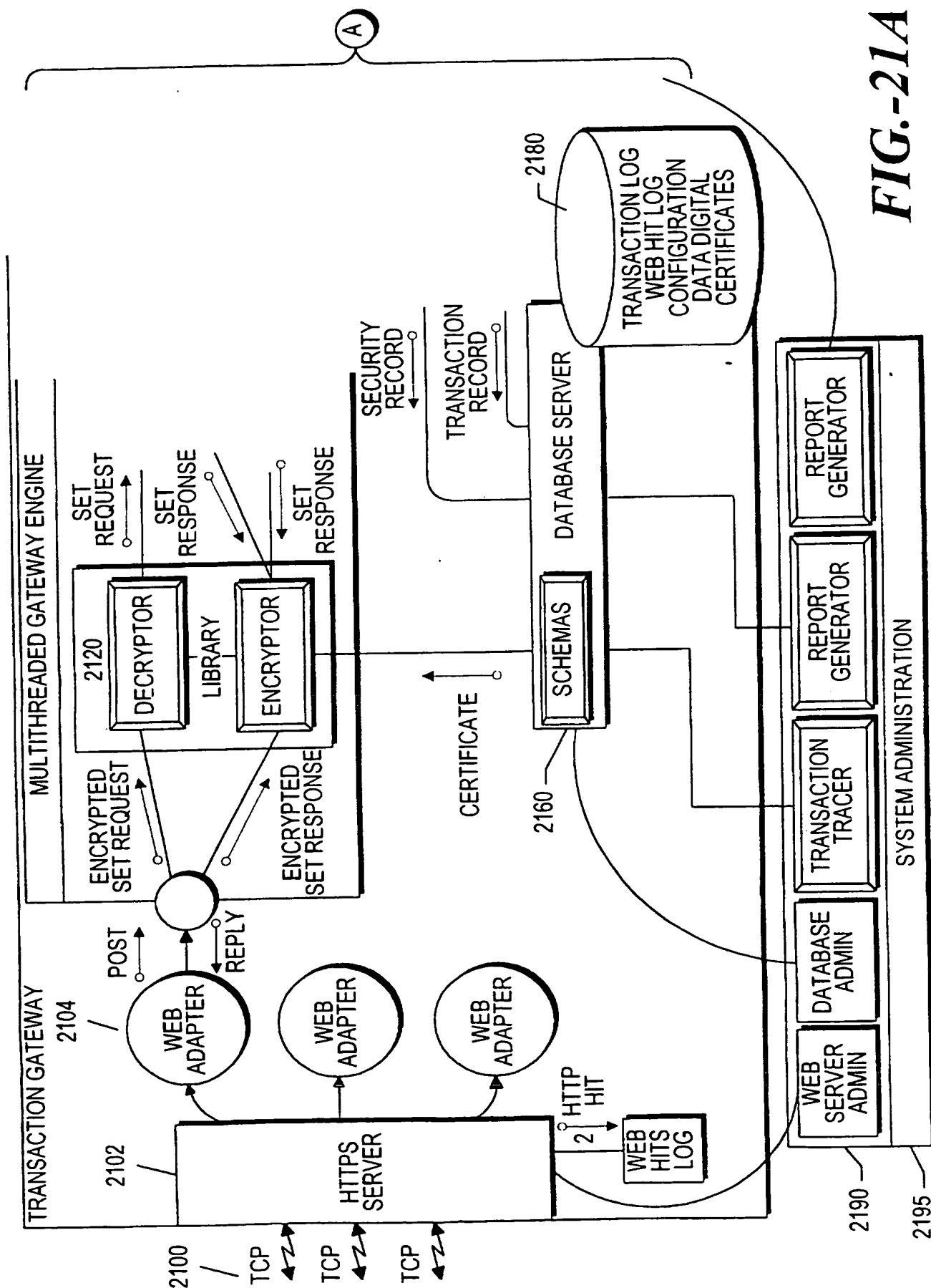


FIG.-21A

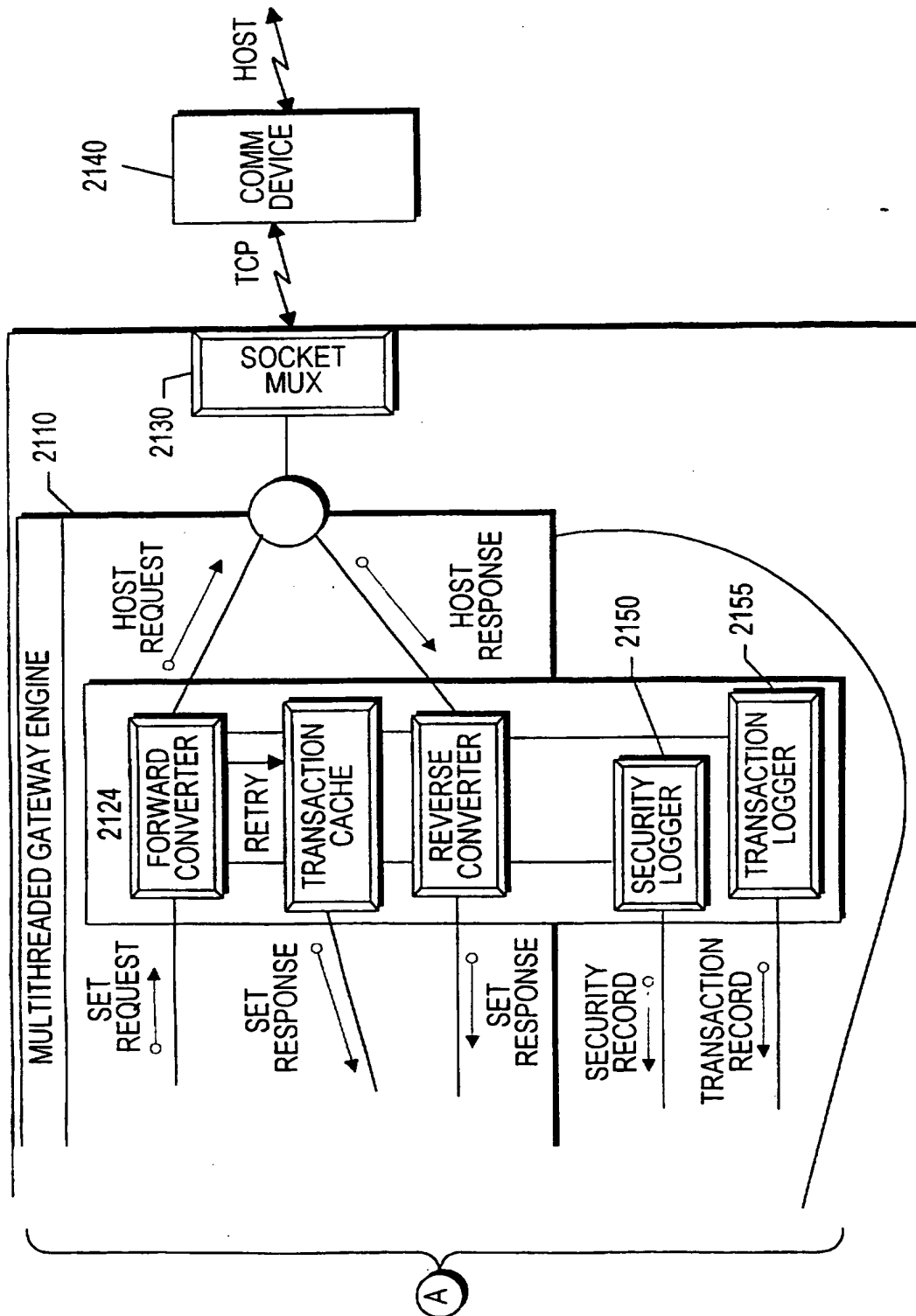


FIG.-21B

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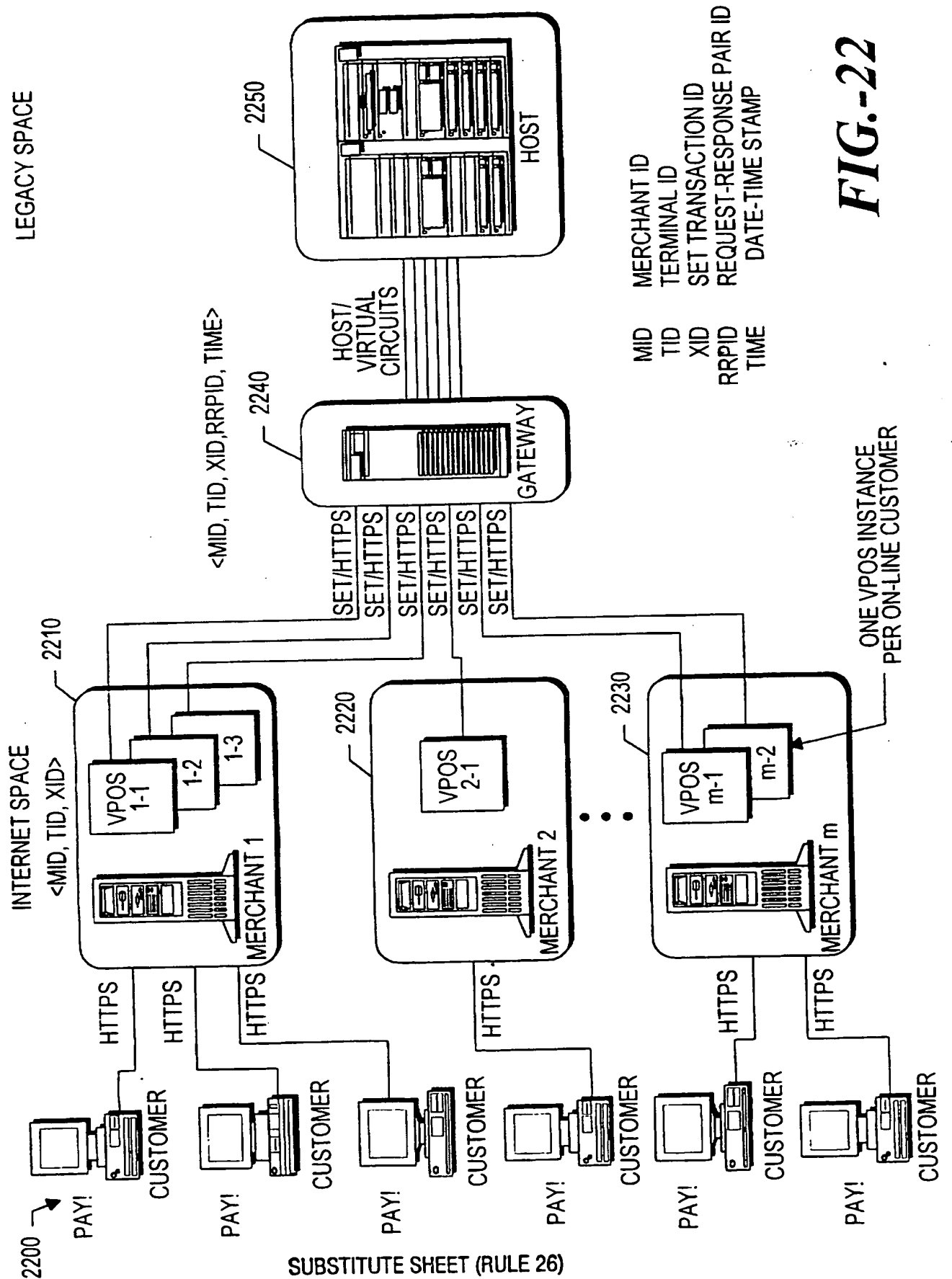


FIG.-22

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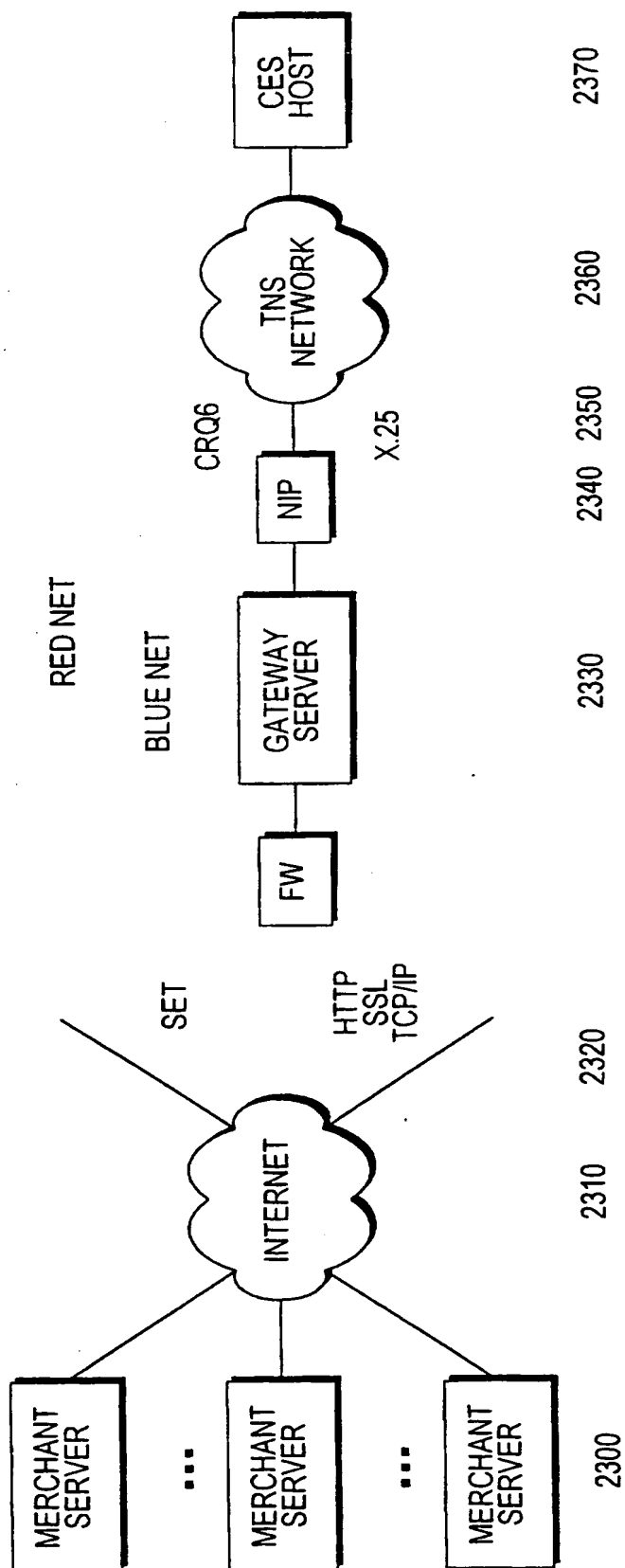
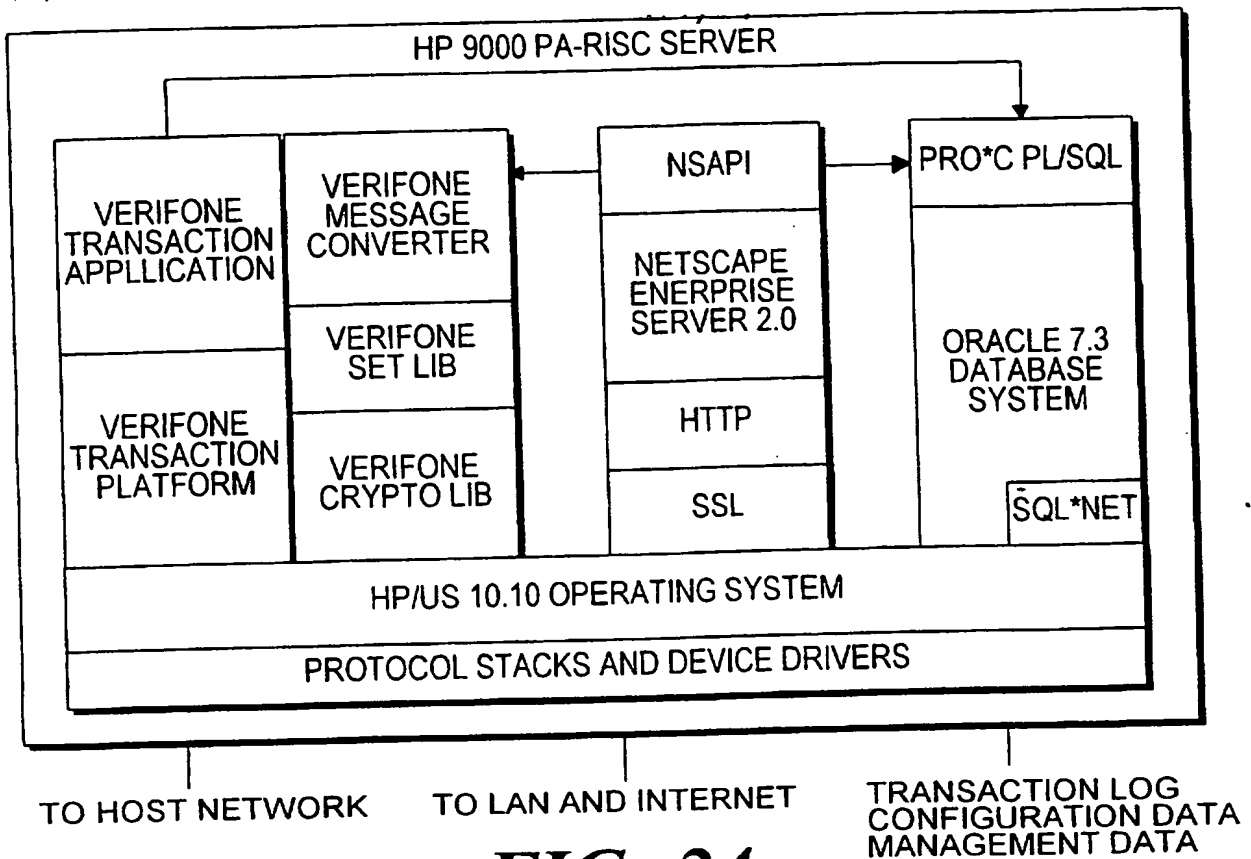
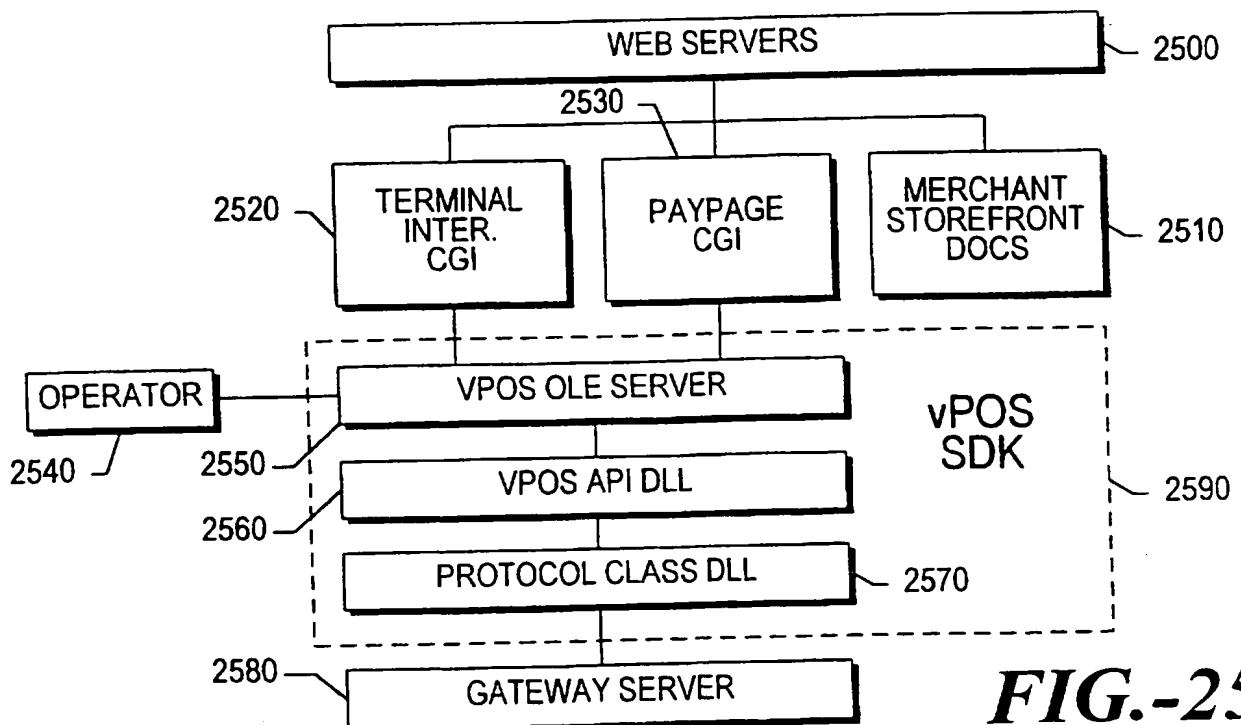
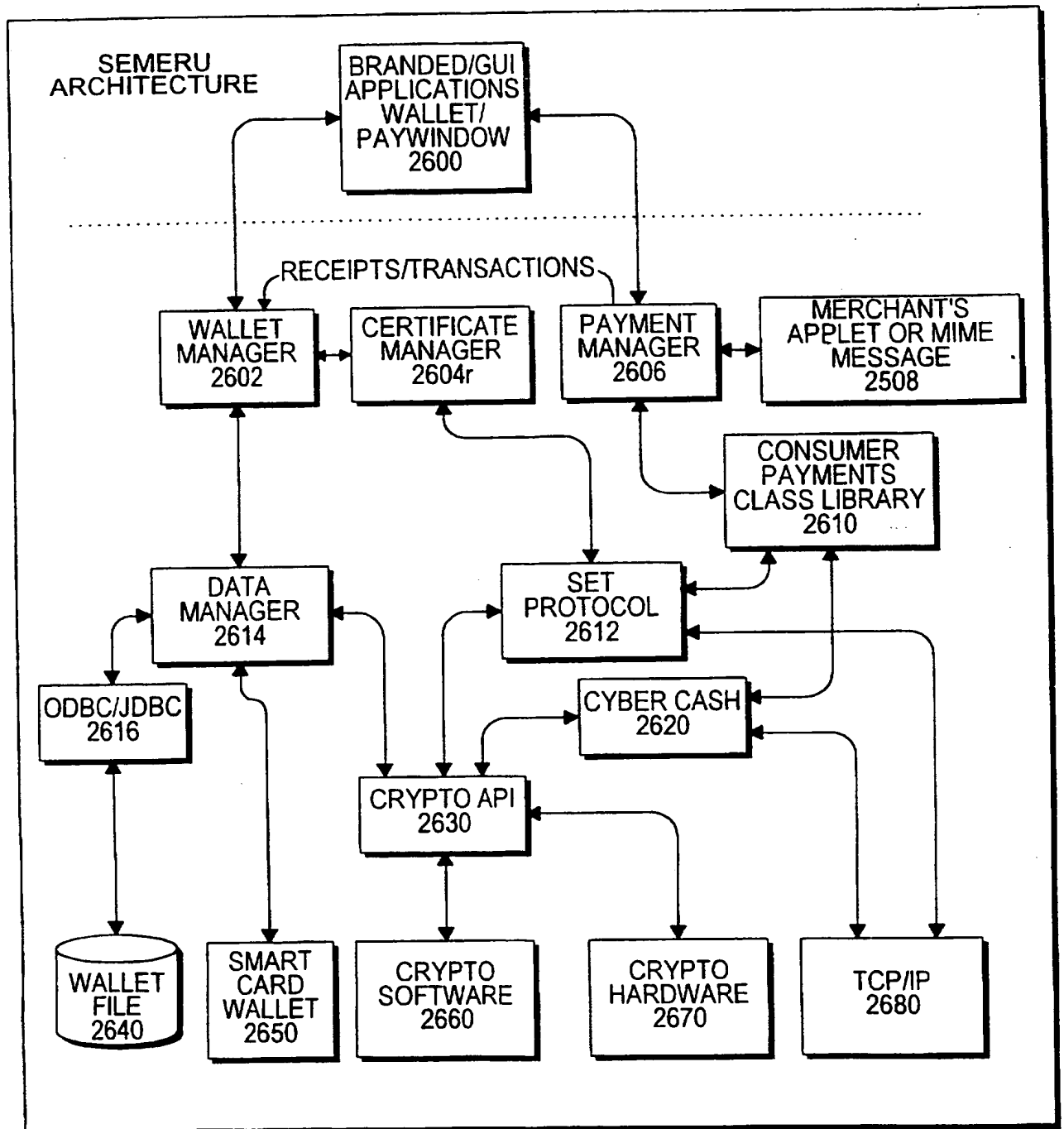


FIG.-23

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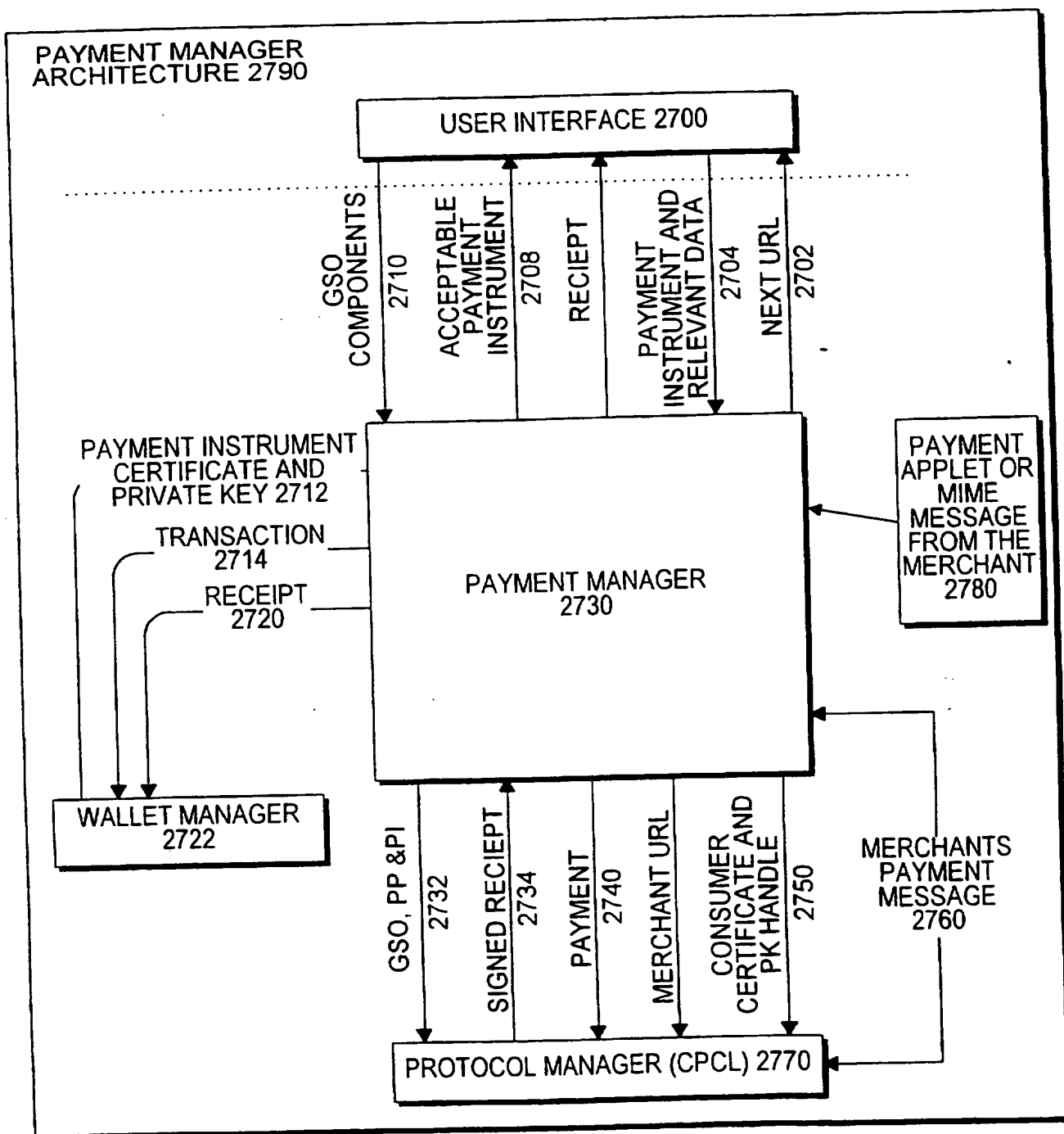
**FIG.-24****vPOS TERMINAL ARCHITECTURE****FIG.-25**

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**FIG.-26**

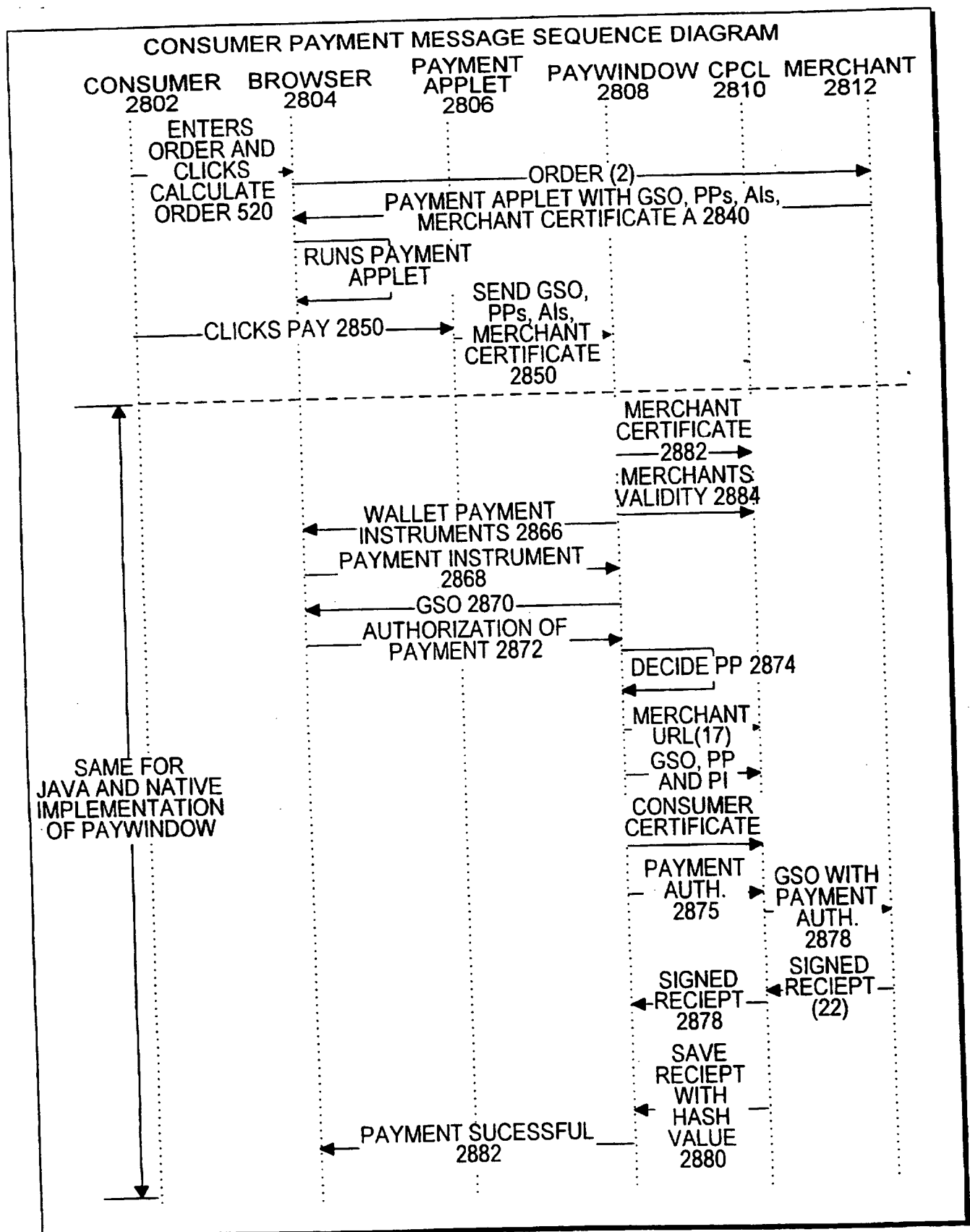
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**FIG.-27**

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**FIG.-28**

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Netscape [http://kimberly/paywind...certificate.request.htm] ▼ ▲

FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP

← → HOME EDIT RE-LOAD IMAGE OPEN PRINT FIND STOP

LOCATION http://kimberly/paywindow/verisign certificate request.htm ▼

What's New! What's Cool! Handbook Net Search Net Directory Software

Certificate Issuance Form

Please enter information into all fields If a field does not apply to you, enter N/A

Card Information

Card Number 4417 2222 3333 9191

Expiry Date 12/98

Personal Information

First Name John

Middle F.

Last Smith

Home Phone # 111 222-3333 (example: 555 555-5555)

Social Security Number 111-22-3333 (example: 999-99-9999)

Date of Birth 12/12/72 (month/day/year as 01/25/50)

Mother's Maiden Name Jones (for security purposes only)

Address

Line 1 141-22 Long Drive

Line2 Kensington

Apt. #

City Palo Alto State CA Zip 94025

VeriFone Wallet Information

Icon Preference Wallet ▼

Password ****

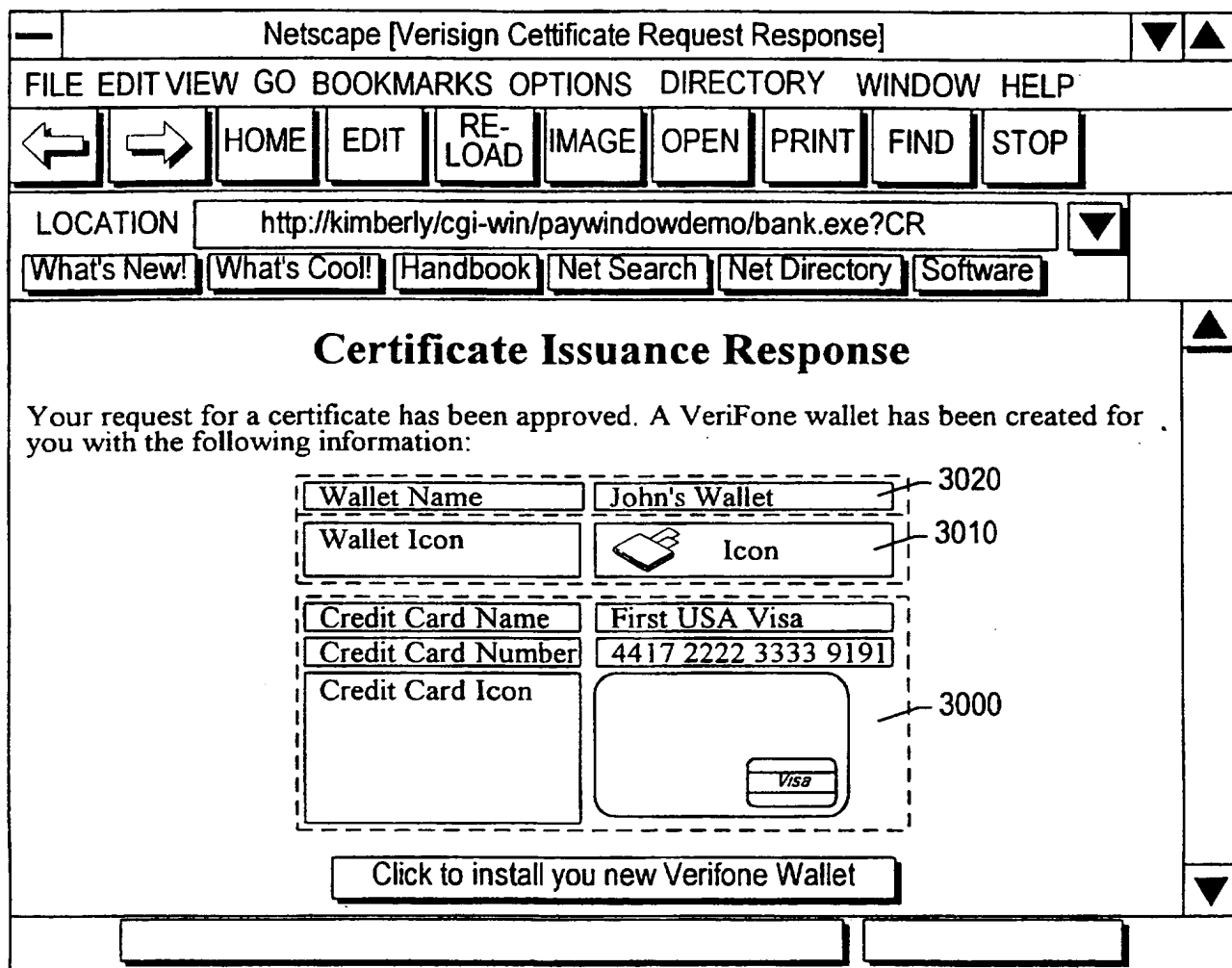
Confirm Password ****

Document Done

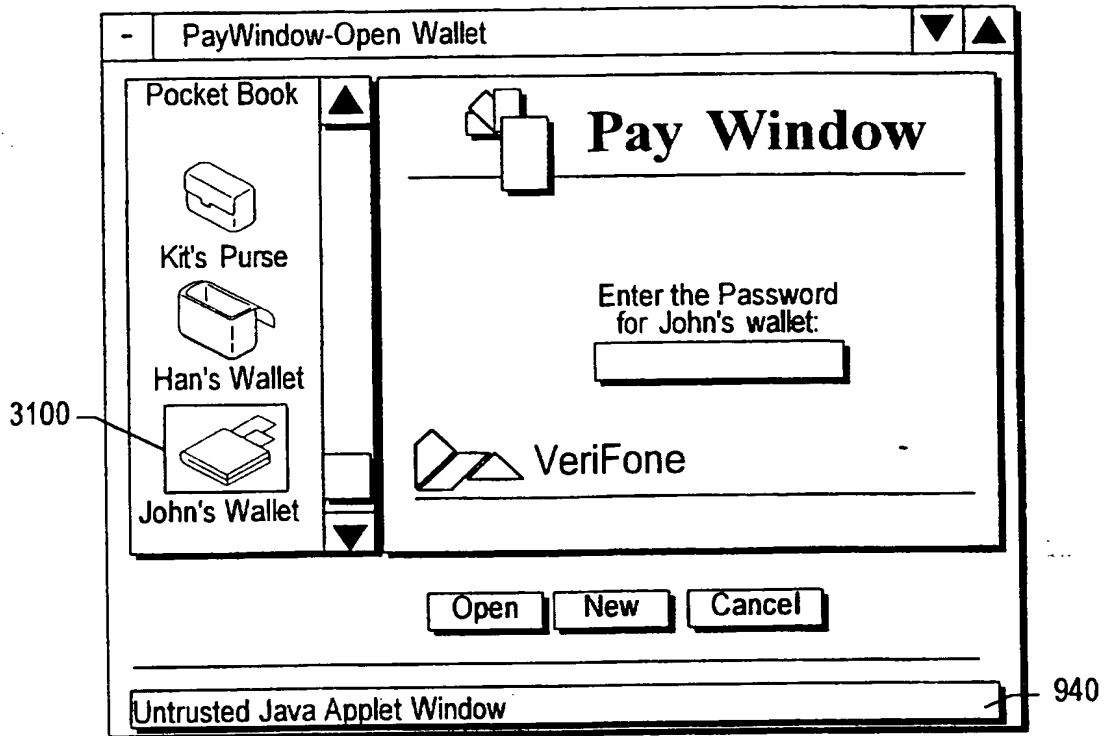
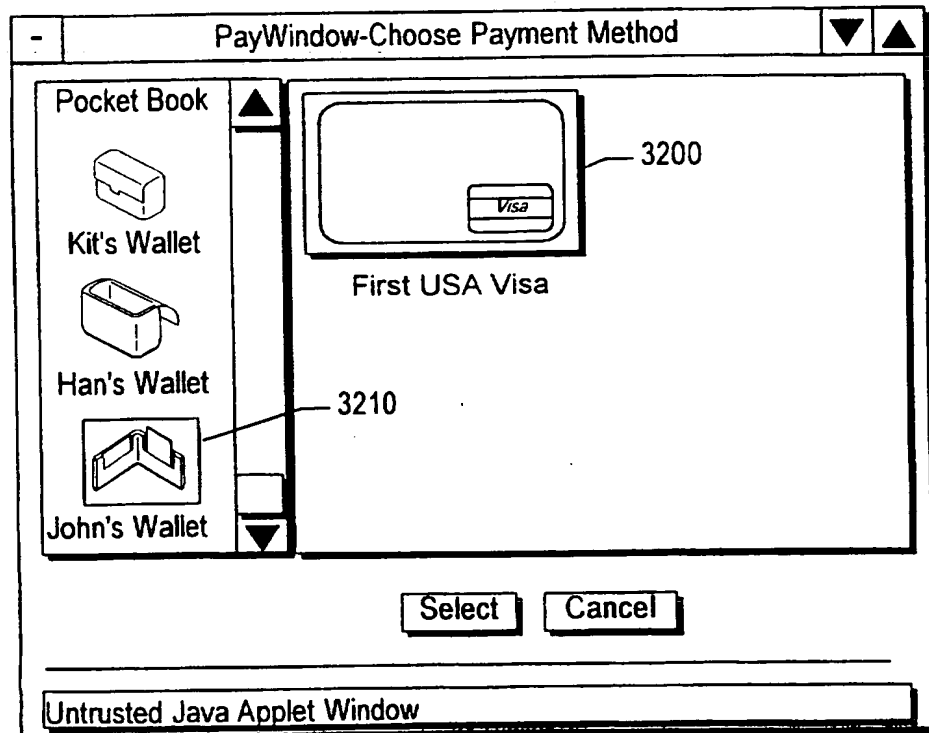
FIG.-29

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**FIG.-30**

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**FIG.-31****FIG.-32**

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PayWindow-John's Wallet

Wallet Payment Address

Card Name: First USA Visa

Card Holder Name: John F. Smith

Card Type: Visa

Number: 4417 2222 3333 9191

Expires: 12/98

Certificate...

☒ Use as default payment method

Add Remove

Done Cancel

FIG.-33

PayWindow-Authorization-John's Wallet

Payment Method

First USA Visa

Change Payment Method

Order	Merchant	Ship to Address
HAWAII'S BEST ESPRESSO		
1 Kona Wailapa Regular		\$18.99
SH		\$8.00
Tax		\$1.12
Total		\$28.11

I Agree To Pay The Total Amount Shown Below
According To The Card Issuer Agreement.
Amount: \$28.11
I Hereby Digitally Sign This Transaction

Accept Cancel

FIG.-34

SUBSTITUTE SHEET (RULE 26)

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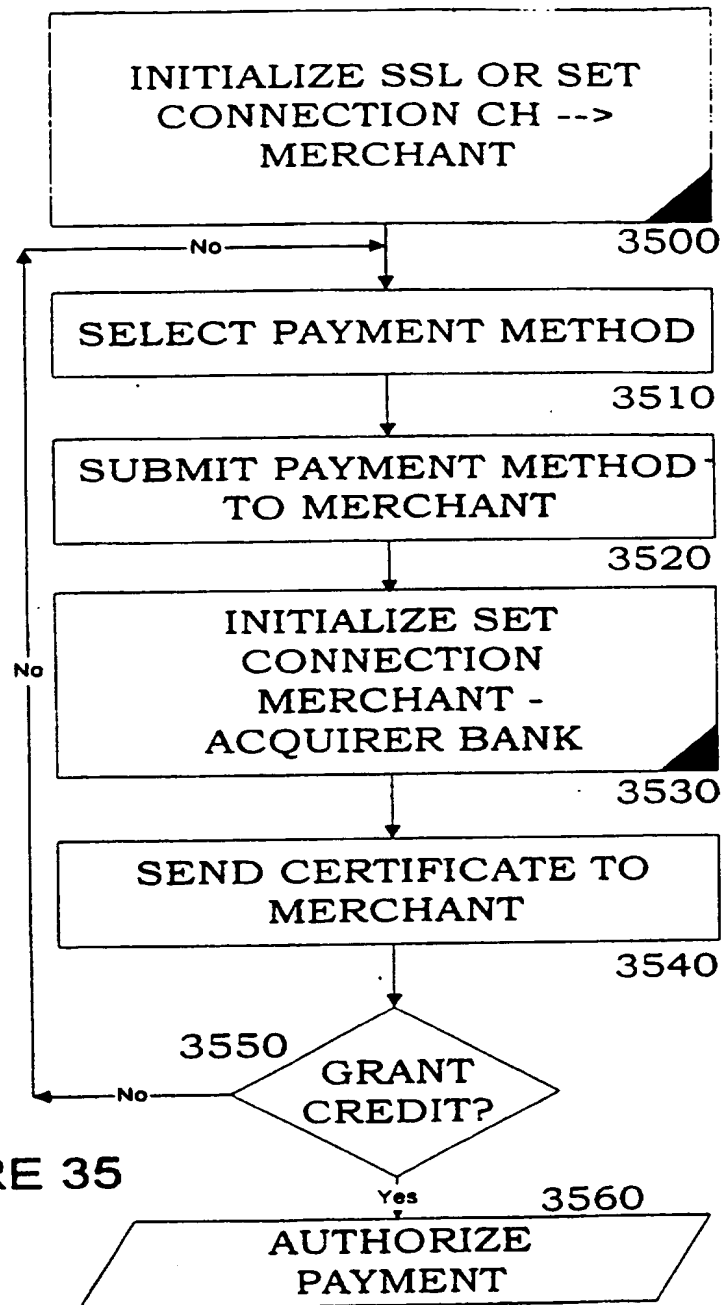
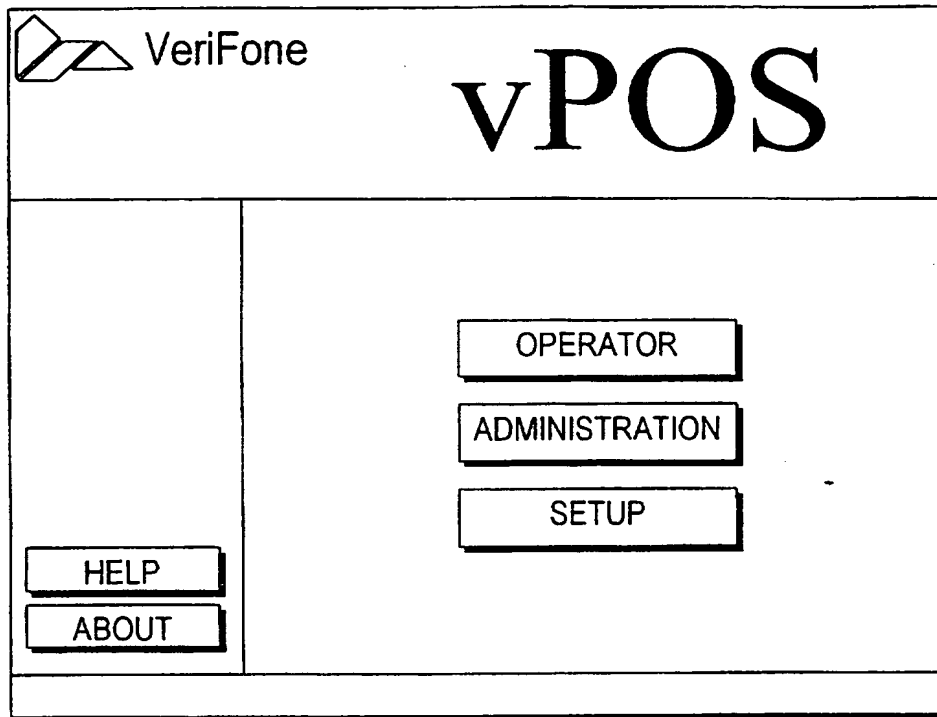
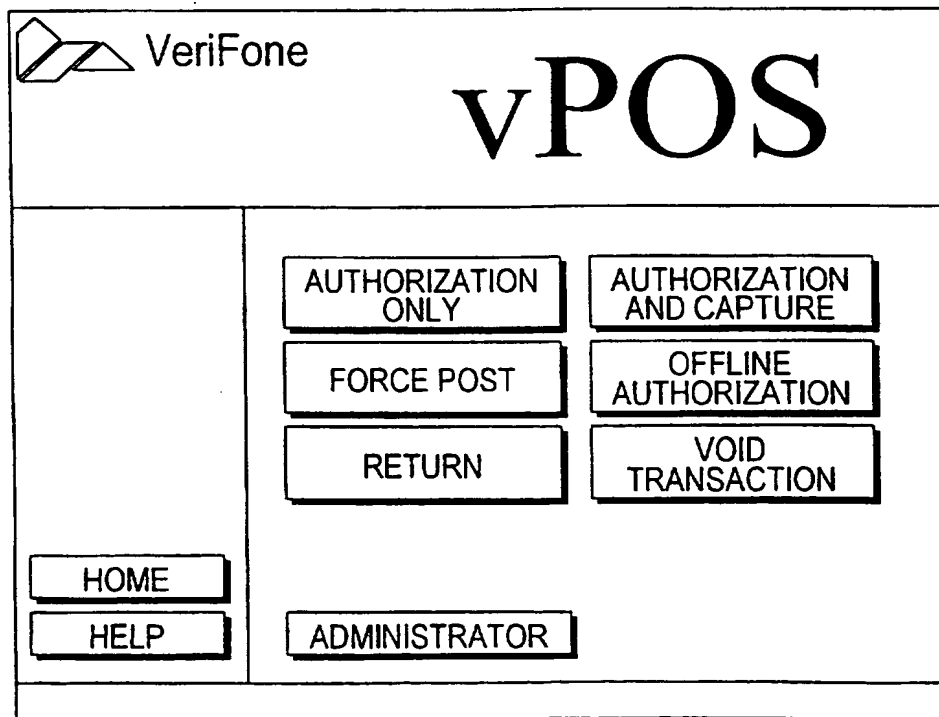


FIGURE 35

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*FIG.-36**FIG.-37*

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VeriFone vPOS

Authorization Only Transaction

Purchase Order Number

Credit Card Number

Expiration Date (Month/Year) /

Transaction Amount -

FIG.-38

VeriFone vPOS

FIG.-39

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Terminal Totals Report

Note: The transaction is not currently implemented. The report below is a sample.

Overall Terminal Totals		
Sales	Trans. Count	25
	Amount	\$6161.70
Credits	Trans. Count	5
	Amount	(\$11.70)
Net Sales		\$6150.70

Visa Totals		
Sales	Num. of Trans.	5
	Amount	\$1232.34
Credits	Num. of Trans.	1
	Amount	(\$2.34)
Net Sales		\$1230.00

MasterCard Totals		
Sales	Trans. Count	5
	Amount	\$1232.34
Credits	Trans. Count	1
	Amount	(\$2.34)
Net Sales		\$1230.00

Discover Totals		
Sales	Num. of Trans.	5
	Amount	\$1232.34
Credits	Num. of Trans.	1
	Amount	(\$2.34)
Net Sales		\$1230.00

American Express Totals		
Sales	Num. of Trans.	5
	Amount	\$1232.34
Credits	Num. of Trans.	1
	Amount	(\$2.34)
Net Sales		\$1230.00

FIG.-40

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JCB Totals		
	Num. of Trans.	5
Sales	Amount	\$1232.34
	Num. of Trans.	1
Credits	Amount	(\$2.34)
Net Sales		\$1230.00

ADMINISTRATOR

FIG.-41**Terminal Setup****Terminal Tables Configuration**

Card(s) Definition Table

Review

Acquirer(s) Definition Table

Review

Merchant Configuration Table

ReviewHelp**FIG.-42****Terminal Type**

CDT List Update/Review

Cards accepted by the merchant

Visa**FIG.-43**

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VeriFone vPOS	
Transaction Type	CDT Record Update/Review
Card	Visa
PANHi	<input type="text" value="4999"/>
PANLo	<input type="text" value="4000"/>
Acquirer	<u>VFITest</u>
BrandID	<input type="text" value="VeriFone Test"/>
CardPicture	<input type="text" value="/vpos/icons/paypage/visa.jp"/>
Maximum PAN Digits	<input type="text" value="16"/>
Minimum PAN Digits	<input type="text" value="16"/>
<input type="button" value="Update"/>	<input type="button" value="Reset"/>

FIG.-44

VeriFone vPOS	
Transaction Type	ADT List Update/Review
Acquirer(s) for the merchant	
<u>VFITest</u>	

FIG.-45

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 VeriFone		vPOS	
Transaction Type		ADT Record Update/Review	
Aquirer	VFITest		
MerchId	<input type="text" value="shouldbeserialnum"/>		
BatchNumber	<input type="text"/>		
Host Name	<input type="text" value="Verifone Test Gateway"/>		
Transaction Ref Number	<input type="text" value="0"/>		
Response Time Out	<input type="text" value="60"/>		
Number of Retries	<input type="text" value="1"/>		
Aquirer Banner	<input type="text" value="/vos/icons/paypage/vfitest."/>		
<input type="button" value="Update"/>		<input type="button" value="Reset"/>	

FIG.-46


 VeriFone		vPOS	
Transaction Type		MCI Update	
Merchant Name	<input type="text" value="tstore"/>		
Merchant e-mail	<input type="text" value="webmaster"/>		
Merchant URL	<input type="text" value="http://localhost/"/>		
Merchant Postal Address	<input type="text" value="?"/>		
<input type="button" value="Update"/>		<input type="button" value="Reset"/>	

FIG.-47

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Order Number 834100050

Bill To

Account Number



Name on Card

Good Through

Address Line 1

Address Line 2

City

State/Province

Country

Zip/Postal Code

Email

Phone

If you wish to have billing defaults set in your browser, check this box

Total=\$59.99

By pressing the PAY button I agree to pay the above total amount
according to the card issuer agreement

**RETURN TO
SHOPPING****PAY****FIG.-48**

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vPOS/GATEWAY Architecture

The architecture of the Virtual Point of Sale (vPOS) and Virtual Gateway (GATEWAY) architecture maintains SET compliance while providing support for additional message types that are not enabled in SET. The architecture includes isolation of cryptographic details in a single module to facilitate single version government approval while maximizing the flexibility of the system for customization and facilitating transfer of updated versions on an acquirer specific basis. Figure 18 is a block diagram of the extended SET architecture in accordance with a preferred embodiment. Processing commences at function block 1800 for a consumer-originated transaction via the World Wide Web (WWW) or 1810 for a merchant-originated transaction on the Internet. In either case control passes immediately to the WWW server 1820 for the transaction to be appropriately formatted and the appropriate interface page presented, whether the transaction is a store front 1822, shopping cart 1824, pay page 1826, standard terminal administration 1828-1830 transaction, or an extended terminal transaction 1834. If processing requires authentication of the transaction, then control passes through the Virtual Point of Sale (vPOS) Application Programming Interface (API) library 1840 for SET compliant transactions and through the vPOS API extensions library for extensions to the SET protocol. Then, at function block 1842, if the transaction is SET compliant, and function block 1864 if the transaction is not SET compliant, a library of protocol stack information is used to conform the message before it is transmitted to a Gateway site for ultimate delivery to a bank host 1874 for authorization.

Extended SET messages are processed at the Gateway site on a two track basis with the division criteria being SET compliance (which will change over time as more functionality is put into SET) or SET extensions. Set compliant messages are processed via the protocol stack library 1862, while SET extensions are processed via the protocol stack extension library 1864. Then, at function block 1870 the gateway engine processes SET and Host specific code including gateway administration extensions 1872 that bypass the normal processing and flow directly from the merchant and consumer server 1820 to the gateway administration extensions 1872 to the Gateway Engine 1870.

As described above, there are three channels by which messages are exchanged between vPOS 1846 and GATEWAY 1856.

1. Standard SET messages

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The standard SET messages are originated by the merchant software either via a pay page 1826 directly controlled by the consumer, or via an operator interface consisting of a set of HTML pages and associated executables launched by the pages (e.g. pay page 1826 and standard terminal administration 1828-1830.) Each SET message type (e.g., authorization v. capture) transmits a different set of data and each requires a different Protocol Data Unit (PDU) to describe its encoding. Examples of how Standard SET messages are encoded are given in the SET documentation previously incorporated by reference.

2. Extended SET messages

The Extended SET messages are utilized as an "escape mechanism" to implement acquirer-specific messages such as settlement/reconciliation, employee logon/logoff, and parameter download. The messages are developed as a set of name-value pairs encapsulated in a PKCS-7 wrapper and wrapped in Multipurpose Internet Mail Extensions (MIME), described in a book by N. Borenstein & N. Freed, "RFC 1521: MIME (Multipurpose Internet Mail Extensions) Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies" (Sep. 1993). The name-value pairs can have arbitrary (8-bit) data, so arbitrary items can be passed through the extended SET channel, including executable programs and Dynamic Load Libraries (DLL)s. Figure 18B illustrates a multipart MIME message with one Extended SET message and one Standard SET authorizing message. Mime is utilized as an outer wrapper 1890 to allow an Extended SET message 1891 to be transmitted as a compon of messages embedded in one MIME multipart message. In this manner, a standard SET message can be sent with an Extended SET message in one vPOS/GATEWAY communication transaction. Embedding the Extended SET messages in a PKCS-7 wrapper enables the same message authentication to occur as in standard SET messages. Thus, for SET-compliant and non-SET-compliant messages, the same mechanism may be used to restrict which entities the vPOS or Gateway will trust in any communications. An important concept in Extended SET is that all messages, of any type, are sent in a uniform name/value pair format, thus allowing a single Protocol Data Unit to suffice for any type of message sent through the Extended SET channel. Since arbitrary data may be sent this way, a mechanism must be provided to preclude the use of the Extended SET channel by parties other than approved financial institutions. If this is not ensured, then the NSA and the US Department of Commerce will not approve the software for export. SET itself to some degree ensures that this Extended SET channel is used only by financial institutions. The protocol stack extension library only processes messages that have

been signed by a financial institution SET certificate that is in turn signed by a payment instrument brand certificate (such as Visa or MasterCard). Stronger control over the Extended SET channel can be achieved by further restricting processing of messages to those signed (either instead of or in addition to the financial institution SET certificate) by a second certificate belonging to a third-party agency, either governmental or private (e.g., VeriFone, as manufacturer of the software).

In this way, a particular set of Extended SET messages can be implemented by Bank X, and a different set of messages by Bank Y. If a vPOS has an extended terminal transaction interface as shown in Figure 18A at block 1834 for Bank X, and has been configured to only accept messages from a Gateway with Bank X's certificate, then it will be able to communicate those messages to a Gateway that has the certificate for Bank X, and accepts messages of the types in Bank X's message set. The vPOS will not be able to connect to the Bank Y gateway, or to any other system that purports to communicate via Extended SET. This restriction is further secured by utilizing a public key certificate that is "hard wired" into vPOS, and which is distributed only to gateways that use the Extended SET mechanism.

Figure 18C is an example flowchart of message processing in accordance with a preferred embodiment. Processing commences at function block 1880 when a message is received by an HTTPS server or other listener and passed to decision block 1883 to determine if the sending vPOS has transmitted an authentic message and if the vPOS is authorized to communicate with this gateway. If the message is not authentic, then the message is logged as an error and the error is handled as shown in function block 1889. If the message is authentic, then the message is decrypted at function block 1884 and the PDU parses the message into name / value pairs. Then, based on the message type and the extended SET version information, the remaining message is parsed at function block 1885 and the message is checked for conformance to the appropriate specification as shown at decision block 1887. If the message does not conform, then it is logged and the error handled at function block 1889. If the message conforms to the proper specification in decision block 1887 then the message is translated into the appropriate host format and sent to the host as shown in function block 1888. Thus; when a gateway receives an incoming message from a vPOS and parses the Extended SET portion of the message, a single MIME message can transmit a SET message and/or an Extended Set Message.

An export license for the encryption can be obtained on a case-by-case basis, and since there will be potentially millions of vPOS's, it is desirable to obtain a commodities jurisdiction for the vPOS, to enable a single version of the vPOS (rather than one version for each bank) to be supported by the vPOS architecture. The architecture described here ensures that the single version of vPOS, no matter how it is configured with extended terminal transaction interfaces, cannot be used to communicate any data other than that contained in the extended SET messages that have been approved for export by the US government to be used exclusively for a specific bank.

Figure **18D** is an example of a simple message between vPOS and Gateway using the Extended SET channel enabling an employee to sign on, or "logon" to a given terminal in accordance with the subject invention. The message must contain the employee's logon ID, a password to be verified by the bank host computer, and the date and time as shown at **1894**. While the contents of the message are shown without encryption in Figure **18D**, it should be noted that the information (including the logon password) are SET encrypted inside the PKCS-7 wrapper **1894**. Certain fields may be designated as mandatory for an Extended SET message, to allow the Gateway or vPOS to decide how to handle the message. For the sake of clarity, in this message **1894**, only two fields, "messagetype" and "ESETversion", are mandatory. These fields inform the Gateway that this message is of type "logon," and that the vPOS is using version "1.0A" of the ESET message formats defined for the Gateway. In this embodiment, the length indicator "[5]" is used to distinguish the length (in bytes) of the field of type "messagetype" in the message. In this way, there are no special end-of-data characters, and therefore arbitrary data need not have any "escaped" characters. It should be noted that using escaped characters will work equally well. Total message integrity is assured by the digital signatures in the PKCS-7 wrapper. This does not, however, preclude the use of other checksumming schemes for additional pinpointing of transmission or encoding errors. The messagetype and ESETversion name/value pairs facilitate Gateway look up of what name/value pairs are expected in the "logon" message. Some name/value pairs may be mandatory, and others may be optional.

Figure **18E** is an example of a simple message between vPOS and Gateway using the Extended SET channel enabling an employee to sign on, or "logon" to a given terminal in accordance with the subject invention. In response to the logon request

message from a vPOS, the Gateway may respond with a "logon accepted" message **1894**, as depicted in Figure **18E**, which vPOS, upon receipt and authentication, then uses to unlock the terminal for that user.

5 Figure **49** shows how the vPOS authenticates an incoming response to a request in accordance with a preferred embodiment. Processing commences at function block **4930** when a message is received by the HTTPS, SET server, or other listener that originated the request to which this response corresponds. The message is passed to decision block **4940** to determine if the sending Gateway has transmitted an authentic message and if the gateway is authorized to communicate with this vPOS. 10 If the message is not authentic, then the message is logged as an error or possible attack and the error is handled as shown in function block **4970**. If the message is authentic, then the message is decrypted at function block **4950** and the PDU parses the message into name/value pairs. Then, based on the message type and 15 the extended SET version information, the remaining message is parsed at function block **4960** and the message is checked for conformance to the appropriate specification as shown at decision block **4980**. If the message does not conform, then it is logged and the error handled at function block **4970**. If the message conforms to the proper specification in decision block **4980** then the message is 20 translated into a standardized argument string to be passed to the appropriate executable or code entry point in the vPOS, as shown in function block **4990**. Thus, when a vPOS receives an incoming message from a Gateway and parses the Extended SET portion of the message, the message may cause vPOS to execute a program that takes action or queries the user to take action.

25

3. Gateway-initiated messages

Since all SET messages between a merchant and an acquirer are currently merchant-initiated (as specified in the SET documentation), there must be a separate mechanism for initiating a message from a gateway, for example to request 30 the upload of management information base (MIB) data, or to download new parameters. This is accomplished by requiring the gateway to send a message to the merchant via a MIME-encapsulated PKCS-7 conformant message containing name-value pairs to the merchant server directly, rather than to the SET module. This channel is shown in Figure **18A** at block **1860**.

35

The message is verified for origination from the acquirer, and is utilized to either initialize a merchant action, such as to update the merchant's administration page

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(for example by blinking a message saying, "PLEASE RE-INITIALIZE YOUR TERMINAL"), or by initiating a request/response message pair originating from the merchant (for example, "HERE ARE THE CONTENTS OF MY MIB"). This is achieved by calling one of the extended terminal transaction interfaces (Figure 18A at 1834), which in turn initiates a SET or Extended SET transaction.

Gateway Customization via the Extended SET Channel

Gateway customization in extended SET is extremely powerful and a novel concept for vPOS processing. Each vPOS contains one or more "serial numbers" unique to each copy of the software (a serial number may be embedded in the software, or may be a component of a public key certificate used in the software). Once a merchant has selected an acquirer and obtained the appropriate certificates, the vPOS can be customized utilizing the communication link and messages containing customization applications. A bank distributes vPOS via different sales channels. The first is direct from a bank to an existing merchant with whom the bank already has an existing relationship. In this case, a version of vPOS already customized for a bank is sent to the merchant, either directly by a bank, or through a third-party distributor or service bureau. The customizations may involve modification or replacement of, for example, a store front 1822, shopping cart 1824, pay page 1826, standard terminal administration transaction interface 1828-1830 or an extended terminal transaction interface 1834. This is a standard model of distribution of software that is customized for small target market segments. The more interesting case, and the one that concerns the novel use of the Extended SET channel, is where the potential merchant acquires, through some non-bank channel, a "generic" vPOS which has not yet been customized to interact with a specific bank. This vPOS can communicate with a "test gateway", which the merchant may use to experiment with the various features of vPOS and to test the integration of the vPOS into a total online storefront. In order to actually transact business over the Internet, the merchant must first obtain a merchant ID from the merchant bank with which he signs an acquiring agreement. For online payment processing, the merchant must also obtain an appropriate set of digital credentials in the form of public key certificates and possibly additional passwords, depending on the financial institution. Once these credentials are obtained, the merchant is ready to customize the already-obtained vPOS to communicate with a merchant bank's gateway.

Using the built-in "serial number" certificate and the Test Gateway public key certificate (which is "hard-wired" into the vPOS software), it is possible to securely

download a particular bank's customization applications to a specific copy of the vPOS software . Once the vPOS is appropriately configured, the last stage of customization download is to configure the vPOS so that it only responds to a public key certificate of the merchant's acquirer. This process is illustrated here in the context of a merchant who obtains a vPOS that talks to the VeriFone test gateway, and desires to customize the vPOS to interact with a gateway at a bank. The merchant has purchased a vPOS from a non-bank channel. The version communicates with the VeriFone Test Gateway. The merchant uses the gateway to learn about using vPOS, and to test the integration of his storefront system with his payment system. The merchant also obtains certificates for payment processing from a bank, the merchant bank of choice for the merchant. The merchant is now ready to customize vPOS to talk to the bank gateway. The flowchart for the merchant interaction with the Test Gateway is shown in Figure 50.

The merchant begins at function block 5000, where the newly-obtained merchant SET certificates are installed in the vPOS. The merchant then directs the vPOS to connect to the VeriFone Test Gateway, by selecting this option from the vPOS terminal administration home page 5005. The choice of this option invokes an extended terminal admin page from the default set of such pages supplied with the generic version of vPOS. This program guides the customization process. The merchant, interacting with the extended terminal admin page, navigates to the list of gateways which is maintained by the Test Gateway, and selects the bank to connect by selecting from the list of banks, at function block 5015. During this process, the merchant's public key certificates are uploaded to the Test Gateway, and checked (at decision block 5025) to verify that the certificates have been signed by the bank to customize the bank for the vPOS. If the certificates do not match, the merchant is advised of the situation in function block 5028, and must select a different bank. If the certificates are not valid SET certificates as detected at decision block 5020, the merchant is advised at function block 5028, and the session terminates. If the certificates are valid and match the selected bank, customization continues at function block 5030. The extended terminal administration program in vPOS receives a list of the customizations from the Test Gateway that must be performed to specialize the vPOS for a specific bank. Some of these customizations are mandatory, while others are optional. In function block 5030, the vPOS advises the merchant of the customizations, prompting for any choices that must be made by the merchant. The merchant's actions at this point drive decision block 5035, in which the vPOS either returns itself to the "generic" state and terminates the

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interaction, or begins the configuration of the vPOS, depending on the merchant's confirmation of the request to begin the configuration. If the merchant has authorized the changes, control is passed to function block 5040 where, the POS stores the certificates of any gateways that it will allow future configuration changes to be initiated from in its database. This may be only a specific bank, such as a bank and the Test Gateway, or other combinations. If only a single, non-Test, bank-owned, gateway is allowed to download changes, the vPOS is no longer customizable for any other bank. Then, a new copy would be purchased by the merchant to have it customized for another bank. If the Test Gateway is still allowed to customize the vPOS, the merchant could switch to another merchant bank and have the current vPOS updated to work with the new bank. In function block 5050, the customizations are downloaded to the vPOS. The downloads comprise a set of HTML pages and a set of executable programs or scripts that read data from the merchant, perform various functions, and present data to the merchant. In general, the customizations downloaded may augment or replace in part or in whole any and all of function blocks 1822, 1824, 1826, 1828, 1830, or 1834 in Figure 18A. At a minimum, the terminal "home page" will be replaced so that it points to the new functionality. At this point, the customization of the vPOS has been completed, and the merchant may now begin sending payment requests to the merchant bank or processor through the vPOS.

Thread Safe vPOS - TID Allocation

Physical terminals process a single transaction at a time since clerks are usually only able to process one transaction at a time. Web Servers can process many transactions at a time, so payment requests can often occur simultaneously. Thus, the vPOS Software must have support for multi-tasking and provide support for multiple threads to be active at the same time in the same system as well as the same process. This requirement is relatively straight forward. However, the authorizing banks require that all transaction requests include a Terminal ID (TID), and, for many banks, no single TID may be active in any two transaction requests that overlap in time. Thus, the vPOS requires dynamic allocation of TIDs to requesting threads. One way of providing for multiple TID's is to assign a "base" TID, and either an "extension" (a set of extra digits appended to the base), or an increment (a number which is added to the base to obtain the complete TID). While such a solution can be used for the majority of banks and processors, not all banks/processors can accommodate this solution. One example is First Data Corporation. For its ENVOY protocol, the terminal ID must use the Luhn check as

recited in an ISO ransrk, which adds a checksum digit to the the terminal ID to reduce chances of fraud or of mistyped information. Thus, to be general enough to handle all bank/processor situations, a pool of TID's is used. The TID's stored in the pool need not be a sequential set of numbers; in fact they can be

5 alpha/special/numeric combinations, and the TID's need have no relation to one another. In a preferred embodiment, a TID is represented as a token in a pool that can be associated with a particular transaction. To provide for this requirement, the vPOS provides a TID pool in tabular form in a database management system (DBMS). This table has two colume: TID NAME & Allocation date/time. If the TID

10 date is null, then the TID is not in use and may be assigned. A date/time field is utilized to allow TID allocations to expire. TID requests are made utilizing a SQL query on the TID Pool to find the first null or expired date/time, which is replaced with the current date/time and the TID name returned.

15 **REMOTE vPOS**

The unique architecture of the Cardholder 120, Merchant 130 and Gateway 140, as shown in Figure 1B, provides communication capability between the modules utilizing the Internet to support linkages 150 and 170. Since the Internet is so pervasive, and access is available from virtually any computer, utilizing the Internet

20 as the communication backbone for connecting the cardholder, merchant and access to the authorizing bank through a gateway allows the merchant vPOS software to be remotely located from the merchant's premises. For example, the cardholder could pay for goods from any computer system attached to the Internet at any location in the world. Similarly, the merchant vPOS system could be located at a central host

25 site where merchant vPOS systems for various merchants all resided on a single host with their separate access points to the Internet. The merchant could utilize any other computer attached to the Internet utilizing a SSL or SET protocol to query the remote vPOS system and obtain capture information, payment administration information, inventory control information, audit information and process customer

30 satisfaction information. Thus, without having to incur the overhead of maintaining sufficient computer processing power to support the vPOS software, a merchant can obtain the information necessary to run a business smoothly and avoid hiring IS personnel to maintain the vPOS system.

vPOS Multi-Merchant Processing

35 Multiple merchant processing refers to the ability of a plurality of merchants to process their individual vPOS transactions securely on a single computer. The architecture relies on each payment page obtaining the merchant name in a hidden

field on the payment page. The vPOS engine receives the merchant name with a particular transaction and synchronizes the processing utilizing a Set Merchant method. This command causes the vPOS API to look up a unique registry tree based on the merchant name. This process causes the vPOS engine to engage the

5 appropriate configuration to process the transaction at hand utilizing a Registry Tree. A registry tree contains Card Definition Tables (CDT)s, Acquirer Definition Tables (ADT)s, Merchant Definition Tables (MDT)s, Protocol Configuration Tables (PCT)s, etc. The CDTs point to specific ADTs since each supported card can be supplied by a distinct acquirer. This is one form of split connection. Each of the

10 ADTs in turn point to PCTs, and some acquirers can support multiple parallel gateways. A merchant's name refers to a unique database in the database management system which contains for example, TIDs. So, for example, to fully qualify a particular merchant in a multi-merchant system, the Acquirer Definition Table is queried to ascertain the particular Gateway (VFITest), then if Bank of

15 America requires verification of network communication information, the particular CardDT is accessed with for example VISA. The particular merchant will service VISA transactions utilizing a particular acquirer. The particular piece of merchandise will also be detailed in a data base. Finally, the merchant Configurations will also be stored in the database to facilitate E-mail and name

20 lookup.

vPOS CLIENT

The interaction between the vPOS and a client commences when a pay page solicits parameters of a transaction. Then, the parameters are validated to be sure the

25 payment instrument, for example, cardnumber is not null. Then, a transaction object is created, eg. AUTHONLY, and the object is initialized and stuffed with parameters of the transaction, eg. ao.setpan(accnum), and the object is executed. This execution invokes the vPOS engine. The vPOS engine further validates the parameters based on the particular merchant's configuration. For example, some

30 merchants do not accept American Express Cards, but will take Visa, and all merchants check the expiration date of the card. Assuming a valid and acceptable card has been tendered, then a TID is assigned (expiring, existing TIDs) or block a new TID from the TID Pool. This generates a STAN, XID, RRPID unique tag and creates an initial record in the transaction database which is flagged as before

35 gateway processing in case the transaction crashes and must be backed out. Then the protocol parameters are identified in the registry based on card type, and a particular acquirer identified. Then, a protocol object is created and executed to

extract results from the protocol object and the before gateway "bit" is flipped to again flag the location of the transaction in the process as it is submitted to the Gateway. The results received back from the Gateway are placed into a transaction object with is reported back to the pay page and ultimately back to the pay page user.

vPOS Merchant Pay Customization

A novel feature of the vPOS software provides payment page customization based on a merchant's preferences. This feature automatically lists cards that are accepted by a particular merchant based on the active terminal configuration. Each approved card for a particular merchant is linked to the display via an URL that provides a pointer to the credit card information supported by the merchant.- Each card has an entry in a data structure referred to as the Card Definition Table (CDT). A preferred embodiment of the vPOS merchant pay customization software in accordance with a preferred embodiment is provided in Figure 19 which illustrates the logic utilizing a flowchart, and a listing of the source code below. Processing commences at terminal 1900 and immediately flows to function block 1910 where an index variable is initialized for stepping through each of the accepted payment instruments for the merchant's page. Then, at function block 1930, a URL key is obtained associated with the current merchant pay page and index value. The URL key is a registry key name that points to a picture of a credit card that the merchant has associated with the pay page and which the merchant accepts as payment. At output block 1940 the card image associated with the URL key is obtained and displayed on the terminal. The CDT entry is obtained at function block 1950 utilizing the URL key. The CDT is utilized for storing information associated with each card. Then, at decision block 1960, a test is performed to determine if the last payment method card has been processed and displayed on the merchant display. If not, then the index is incremented at function block 1920 and the loop reiterated to process the next card at function block 1930. If all the cards have been processed, then control is returned to the merchant program for processing the transaction at terminal 1970.

Figures 20A through 20H are block diagrams and flowcharts setting forth the detailed logic of thread processing in accordance with a preferred embodiment. Figure 20A illustrates a prior art approach to POS processing utilized in most grocery stores and department stores today. POS Terminal 2001 accepts transactions provided to it one at a time by customers 2000. For each transaction,

POS Terminal **2001** builds a transaction request **2002** and transmit it to acquiring bank **2004** over communications link **2003**.

Figure **20B** is a data structure **2002** representing a POS transaction request in accordance with a preferred embodiment. The data structure **2002** includes a TID field **2005**, which identifies the physical terminal from which the transaction originates. In addition to the TID field, the data structure also includes other data **2006** necessary to process a transaction. This data includes such fields as a transaction type, a transaction amount, a currency type (such as U.S. dollars), credit card account number, credit card expiration date, etc.

Figure **20C** illustrates a vPOS architecture with account requests being processed by a single acquiring bank. vPOS **2007** processes a plurality of customers **2000** concurrently. For each such customer **2000**, vPOS **2007** builds a data structure **2010**, representing the transaction to be performed for that customer. Each data structure **2010** contains a unique "virtual terminal" ID. vPOS **2007** selects a virtual terminal ID using database **2008**. For each data structure **2010**, vPOS **2007** initiates communication with acquiring bank **2004** using communication link **2003**.

Figure **20D** is a data structure **2010** representing a vPOS transaction request in accordance with a preferred embodiment. The data structure **2010** includes a TID field **2012**, which identifies a virtual terminal ID associated with a particular transaction. In addition to the TID field **2012**, the data structure also includes other data **2006** necessary to process a transaction. This data includes such fields as a transaction type, a transaction amount, a currency type (such as U.S. dollars), credit card account number, credit card expiration date, etc.

Figure **20E** illustrates a TID allocation database **2008** in accordance with a preferred embodiment. Database **2008** includes a TID allocation table **2011**. TID allocation table **2011** includes a plurality of rows, one for each TID used by each acquiring bank. One such row **2013** is illustrated in detail. Row **2013** includes a good/service order (GSO) identifier **2014**, which identifies the order being transmitted; a TID field **2015**, which identifies a terminal ID that may be used with a particular acquiring bank; and an acquiring bank field **2016**, which identifies the acquiring bank for which the TID is valid. In addition, row **2013** may optionally include other fields **2017** that may be used in conjunction with the order processing.

A null GSO value indicates that the TID/Acquirer combination is not currently in use.

Figures **20F** through **20H** are flowcharts of the detailed logic used to perform virtual terminal ID allocation. Figure **20F** illustrates the main line operation of virtual TID allocation. In step **2020**, execution begins. In step **2021**, a skeletal transaction request structure is prepared. In step **2022**, the main line routine obtains a virtual TID for inclusion within the transaction request structure, as will be more fully disclosed with reference to Figure 20G, below. In step **2023**, the routine verifies that a TID was obtained. If the TID was not obtained, for example, if more transactions are currently being processed than there are TIDs, then execution continues to step **2024**. In step **2024**, the transaction request is put on a queue for future processing. In step **2025**, the routine waits for a transaction process to end, which would free up a TID in use. At that point, control resumes from step **2022**, and the routine again attempts to obtain a TID.

If the TID was successfully obtained in step **2023**, control proceeds to step **2026**. In step **2026**, the routine submits the transaction to the acquiring bank. In step **2027**, the transaction is processed. In step **2028**, the routine makes a database call to free up the TID that was used in the transaction. In step **2029**, transaction processing ends.

Figure **20G** depicts in detail the process of obtaining a TID from the database. Execution begins in step **2040**. In step **2041**, the routine constructs a database call to reserve a TID for processing, for example, by constructing an SQL statement to retrieve a TID row from the database. In step **2042**, the routine executes the database call that was constructed in step **2041**. In step **2043**, the routine constructs a second database call to extract the TID from the row that was reserved in step **2042**. In step **2044**, the database call constructed in step **2043** is executed to obtain the TID. In step **2045**, a return code is checked to verify whether the TID was successfully obtained. If the TID was successfully obtained, control proceeds to step **2046**, which returns to the calling program. If, however the TID was not obtained, control proceeds to step **2047**. In step **2047**, the routine checks to see whether an excessive number of retries have already been attempted. If there have been an excessive number of retries, control proceeds to step **2048**, which exits with an error indication. If there has not been an excessive number of retries, control proceeds once again to step **2043** to retry the extraction operation.

Figure 20H depicts the operation of releasing a TID that had been used in a prior transaction. Execution begins in step 2060. In step 2062, the routine constructs a database call to update the row for the selected TID so that the value for the good and service order is null, thereby indicating that the selected TID is not associated with any good or service order, and is therefore free for reuse. In step 2064, the routine executes the SQL statements constructed in step 2062, thereby releasing the TID for use in future transactions. In step 2069, the routine returns to the calling program.

Default Gateway Configuration

The vPOS is initially shipped enabled to connect to a default gateway with a single instance of a gateway defined that accesses a predefined site for testing of an installation before bringing it online in a production mode. The test installation contacts and converses with an actual gateway that simulates live transactions. After the installation checks out utilizing a set of test transactions, the test gateway downloads the pre-checked customizations to the installation so that it can switch over to the production acquirer. This download processing is enabled in extensions to SET.

Internet Transaction Gateway

Payment methods that issue cards for conducting business utilize four major entities. These entities are the issuer, consumer, merchant and the acquirer. The issuing bank that provides the consumer with a credit card are usually not the same bank as the acquiring bank that serves the merchant. When the consumer utilizes a credit card to pay for a purchase, the merchant swipes the card through the POS terminal which makes a connection to the merchant's acquirer via the telephone network and transmits an authorization request with data read from the magnetic stripe. The acquirer's host processor, depending on the card number, will either perform local processing or switch the request to the correct issuing bank's host processor through the interchange network. In a few seconds, the authorization response is returned to the originating POS indicating either an approval or a rejection. The Internet is a viable infrastructure for electronic commerce.

Ubiquitous browser software for the World Wide Web provides around-the-clock access to a large base of information content provided by Web servers. Utilizing a preferred embodiment, consumers using browsers can shop at virtual stores and malls presented as Web pages managed by the merchants' servers. Consumers can

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- make purchases and pay for them using credit cards or other digital payment instruments in a secure manner. For such Internet-based payments to be authorized, a "gateway" is necessary at the back end to channel transactions to legacy processors and interchange networks. Figure 21 is a detailed diagram of a multithreaded gateway engine in accordance with a preferred embodiment.
- Processing commences when a TCP transaction 2100 is received by a HTTPS Server 2102 and parsed to an appropriate Web Adaptor 2104 which posts an encrypted set transaction to the multithreaded gateway engine 2110. The encrypted SET request is received at a decryptor 2120, decrypted into a standard SET transaction and authenticated for converting by the forward converter 2124. Inside the forward converter 2124, decides if the request is an original request, and honest retry attempt or a replay attack. The converted transaction is passed to the socket multiplexor 2130 to communicate via an existing communication link 2140 to a host computer. A security logger 2150 is also utilized for passing security records back via a database server 2160 to a database administration application 2190. A transaction logger 2155 also utilizes the database server 2160 to capture transaction logs in a database 2180. Other system administration tasks 2195 include a web server administration task 2190 which logs web hits in a log 2170.
- Figure 22 is a flow diagram in accordance with a preferred embodiment. Processing flows from customers 2200 that are paying for products over the Internet or other communication medium utilizing HTTPS or other protocols to one or more merchants 2210, 2220 or 2230 to a gateway 2240 which directs transactions to a particular host processor 2250 for authorization processing in accordance with the present invention.

Internet Payment Authorization

- The Gateway is a secure computer system that mediates transactions between the merchants' servers and a payment processor. The Gateway supports secure communications between merchants using the Internet on one side, and a processor using standard secure financial networks on the other side. Between the two interfaces, the Gateway maintains a detailed log of all transactions, whether in-progress, completed, or failed. The Gateway accepts transactions from merchants and converts them into legacy compatible formats before forwarding them to the host processor. Responses from the host, after the reverse conversions, will be returned to the originating merchants.
- The Gateway performs many functions, including:

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- Receives encrypted credit card transactions from the merchants via the Internet
- Unwraps and decrypts transactions
- Authenticates digital signatures of transactions based on certificates
- 5 • Supports all transaction types and card types
- Accepts concurrent transactions from each of the merchant servers
- Converts transaction data to legacy formats; forwards the mapped requests (in the clear) to a payment processor over existing communication links
- Converts transaction responses, correlates them with the original requests, and sends the mapped responses back to the merchants
- 10 • Provides logging, monitoring, reporting, and system administration

Figure 23 illustrates a Gateway's 2330 role in a network in accordance with a preferred embodiment. The Gateway 2330 strictly conforms to all SET stipulations regarding certificate management, PKCS signed data encapsulation, PKCS encrypted data encapsulation, ASN.1 representation, DER encoding, MIME encapsulation, and message sequencing. A merchant server 2300 communicates via the Internet 2310 using the SET protocol 2320 through a gateway server 2330 using a network interface processor 2340 to communicate to a legacy network 2360 in, for example the X.25 protocol 2350. The legacy host 2370 ultimately receives and processes the transaction from the merchant server 2300 without modification to its code.

Internet Communication Protocols

As discussed above, the TCP/IP protocol suite is utilized at the transport level. At the application level, in compliance with SET, all requests arrive at the Gateway in MIME encapsulated HTTP format. Similarly, all responses from the Gateway to the merchant servers will be transferred in HTTP. The HTTP protocol stipulates that a request-response pair will go through the same TCP connection and that the originator, in this case a merchant server, will establish a connection to send the request and will take down the connection when it has received the response.

Host Payment Protocols

Message conversions performed by the Gateway will be significantly more than format transliterations: per-protocol differences in data elements and message semantics must be considered carefully. Some of the transaction types that are supported are listed below.

Transaction Types
Credit card sale with capture
Credit card sale without capture
Credit card sale with capture including AVS (MasterCard and VISA)
Credit card sale without capture including AVS (MasterCard and VISA)
Credit card return (Credit)
Credit card post authorization (Force Post)
Credit card post authorization (Force Post) with partial reversal support, enhanced authorization data, and AVS result code (VISA)
Credit card sale with capture - Void
Credit card return (Credit) - Void
Totals request (for balancing)

Host Communications Protocols

- A virtual, private network between the Gateway and the host processor is established to expedite host communication. In addition, two Network Interface Processors (NIP)s - a "near end" NIP that interfaces to the Gateway and a "far end" NIP that interfaces to the host. The NIPs will handle virtual connections between themselves. The far-end NIP will take care of specific communication details. The near-end NIP is an IP-addressable device that converts between TCP messages and packets. It is installed on a public network **2330**, which is a LAN outside the corporate firewall. The Gateway, on the secure public network **2330**, utilizes TCP/IP **2320** to communicate with the near-end NIP.

GATEWAY FEATURES

- Because the Gateway must sustain reliable operations and enable graceful evolution, it is designed with some important attributes, including: Security, Availability, Performance, Scalability, and Manageability.

Security

Channel Security

- At the application level, SET provides signed and encrypted data encapsulations of payment information portions of the transaction messages. Transport-level encryption of the entire message packet is required for additional security. The HTTPS protocol - i.e., HTTP over SSL 3.0 - is utilized between the merchants and the Gateway. The virtual connections between the near-end NIP and the host are part of a private network. The termination will occur outside the firewall. Data between the

Gateway and the host is sent in the clear with no encryption. In this network configuration, a transaction between a merchant's vPOS and the host will cross the firewall four times: SET request from vPOS to Gateway, legacy request from Gateway to NIP, LEGACY response from NIP back to Gateway, and SET response from Gateway back to vPOS.

Certificate Management

Payment Protocol Certificates

The Gateway uses certificates to authenticate the two parties involved in each MOSET transaction. Through a Certificate Authority, one certificate is issued for the Gateway and one certificate for each of the merchant servers.

Secure Channel Certificates

SSL will require separate certificates for the Gateway and the merchants.

Availability

Site redundancy and location redundancy allows the Gateway to sustain service through virtually instantaneous recovery from internal failures or external disasters that cause physical damages to the system. Minimum-outage recovery is possible with redundant configurations of important components.

Site Redundancy

The Gateway supports connections to a proprietary bank network and supports mirrored disk arrays.

Location Redundancy

The Gateway architecture supports location redundancy where a secondary remote system is connected to the primary system via dedicated WAN links for software-driven database duplication.

Scalability

The Gateway software architecture, the choice of third-party software components, and the selection of hardware platforms enable the system to gracefully adapt and evolve to take on new demands in different dimensions.

The Gateway resides on an HP 9000 that is housed in a standard 19" EIA rack.

Gateway Hardware Configuration

Server Hardware Description
K-Class SMP Server - Model K420 - Standard Configuration
120 MHz PA-RISC 7200 CPU
128 MB ECC RAM
Built-in I/O includes Fast/Wide/Differential SCSI-2, EtherTwist 802.3 LAN,

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AUI, RS-232C Connectors, Centronics Parallel Port, and Internal Modem	
650 MB CD-ROM Drive	
HP-UX 10.10 Operating System (with two-user license)	
4 HP-PB Slots	
Additions	
1	SCSI-2 Disk Controller <i>to support disk mirroring over dual SCSI-2 buses</i>
1	2 GB Internal SCSI-2 Disk Drive, 20MB/s transfer rate, not mirrored <i>for systems software and swap space</i>
1	4 GB External High-Availability Disk Arrays <i>for databases – total of 4 x 2 MB modules required</i>
1	4 GB DAT drive with data compression
1	HP-PB Slot Expansion Option <i>provides 4 additional HP-PB slots for peripheral controllers</i>
2	FDDI interface cards (each card uses 2 HP-PB slots)
1	Option for eight-user license for HP-UX

Cryptographic Hardware

The encryption and decryption algorithms used in processing SET/SSL messages require significant computational power. A "security processor" is deployed with the Gateway to boost the performance of cryptographic algorithms. The processor is a networked peripheral device to the HP 9000 server. It provides cryptographic services suitable for SET/SSL processing, and its services are accessible via calls to software libraries running on HP-UX. Figure 24 is a block diagram of the Gateway in accordance with a preferred embodiment.

Gateway Architecture

Operating System Software

The Gateway runs under the HP-UX Version 10.10 operating system and is upgraded to support future significant system releases. HP-UX 10.10 conforms to major standards, including:

- X/Open UNIX 95 (conforming with the Single UNIX Specification, SPEC 1170)
- X/Open Portability Guide Issue 4 Base Profile (XPG4) OSF AES
- IEEE POSIX 1003.1 and 1003.2
- AT&T System V Interface Definition (SVID3 base and kernel extensions subset)

Level 1 API support

- UC Berkeley Software Distribution 4.3 (BSD 4.3) including such features as job control, fast file system, symbolic links, long file names, and the C shell
- System V.4 File System Directory Layout

This compliance with various software standards assures that while a preferred embodiment of the invention is disclosed in association with a best mode of practicing the invention other similar software and hardware environments can be readily substituted without undue experimentation.

Relational Database Management System (RDBMS) Software

The Gateway uses Oracle7 Server version 7.3 as the RDBMS and will be upgraded to use future significant system releases. The multi-threaded, multi-server architecture of Oracle7 provides applications with scalability to high-volume transaction workloads. When deployed with the HP 9000 K-Class platform, Oracle7 performs a symmetrically parallel database operation across all available processors. In addition, Oracle7 includes options for creating high-availability systems:

- The Oracle7 *Parallel Server* option extends the reliability of applications by transparently harnessing the power of clustered computers in a single logical processing complex that can tolerate individual machine failures.
- Oracle7 *Symmetric Replication* provides high data availability. Data can be replicated from the primary system to one or more alternative sites.

HTTP Server

The Gateway utilizes Netscape's Enterprise Server 2.0 as the HTTP server. The server is designed for large-scale Internet commerce deployment, Enterprise Server 2.0 achieves performance and reliability with such features as optimized caching, SMP support, enhanced memory management, and SNMP-based performance monitoring. Efficient process management features minimize system load and increase server reliability. Security features are provided using the SSL 3.0 protocol.

Protocol Stacks

Internet and LAN - The TCP/IP protocol stack will be provided as part of the HP-UX operating system.

Other Application-Level Protocols

Application-level protocols enable client-server interoperability. Each of the following protocols are transported using TCP or UDP.

- **HTML.** HTML will be used to define screens for Gateway system administration.
- **HTTP.** The HTTP layer is part of Enterprise Server 2.0. The server is administered with a Web browser.

- **SQL*Net.** The Gateway's Oracle7 database can be accessed by administration clients using SQL*Net. Administration software can establish database connectivity to retrieve data for generating transaction reports.
- **SNMP.** Enterprise Server 2.0 can be monitored using SNMP. The Gateway
5 utilizes SNMP for remote system management.

Transaction Performance Monitoring and Measurement

- The "hits" performance indicators are available from the Web server. Statistics can be generated at any time to highlight the load pattern or to pinpoint the time when the server was most active.
- Gateway statistics about transaction requests (by transaction type) and
10 transaction results (e.g., success, failed due to host, failed due to authentication, etc.) can be determined at any time for a particular time interval by generating a report.

The Gateway is upgradeable to interoperate with a real-time event monitoring
15 system such as OpenVision's Performance Manager.

Basic Request/Response Mappings

The following table shows the basic request/response mapping between the SET protocol and the LEGACY protocol.

SET Request / Response Pair	LEGACY Request/Response Pair and Transaction Code
AuthReq, AuthRes	LEG/CTR (05)
AuthRevReq, AuthRevRes	LEG/CTR (99)
CapReq, CapRes	LEG/CTR (42 or 44)
CapRevReq, CapRevRes	LEG/CTR (41)
CredReq, CredRes	LEG/CTR (40)
CredRevReq, CredRevRes	LEG/CTR (90)
BalReq, BalRes	CTA/CTL (48)

20

Gateway Analysis for SET Message Handling

This section tackles general design considerations of the Gateway software and is not limited to LEGACY (unless specifically mentioned). The complete functional
25 behavior of the Gateway will be described in a separate document.

Replay Attack Handling

A replay attack at the Gateway is a request where either:

- a) the request is *stale*; the request was received "too late" with respect to the *reqdate* in the request. This window is specified by a configurable Gateway policy.
- b) the request is not stale but the exact *rrpid* (Request/Response Pair Id) has already been seen before in a request and still logged in the Gateway database. The *<xid, mid, rrpId>* tuple will be the primary key that determine whether a request had already been received. This will allow the possibility of the same *rrpid* to be generated from the same merchant but for a *xid* and also allow the same *rrpid* to be generated by a totally different merchant.

New Attempt vs. Retry Attempt

It is possible that messages sent between the vPOS and Gateway may be lost in transit. This could happen either because of hardware/software problems in the Internet or for hardware/software reasons local to the Gateway or Merchant System.

The question is then "How does a Gateway recognize an honest retry attempt from an initiator?" First a little background into the nature of a SET request. All SET requests have the following fields:

<i>xid</i>	merchant's transaction id
<i>mid</i>	merchant id (contained in certificate)
<i>tld</i>	terminal id (from Merchant System)
<i>rrpid</i>	request response pair id
<i>reqdate</i>	request date (from Merchant System)
<i>reqdata</i>	request specific data

Let the following tuple represent a generic SET request:

<xid, mid, tid, rrpId, reqdate, reqdata>

The merchant establishes the *xid* during the shopping phase with the consumer.

The same *xid* is used for both the *AuthReq* and the *CapReq* and subsequent

CreditReq requests. Using the same *xid* for many requests makes it impossible for the Gateway to distinguish between repeated transactions vs. new transactions.

For example, how could a Gateway possibly determine whether two valid *CredReq* requests were to be interpreted as two individual credits or a retry of a single request.

request 1: *<xid₁, mid_m, tid₁, rrpId₁, reqdate₁, reqdata₁>* (perhaps a *CredReq* for \$10.00)

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request 2: $\langle xid_1, mid_m, tid_i, rrp_{id_2}, reqdate_2, reqdata_1 \rangle$ (perhaps a new *CredReq* for \$10.00)

could also be interpreted as...

5 request 1: $\langle xid_1, mid_m, tid_i, rrp_{id_1}, reqdate_1, reqdata_1 \rangle$ (perhaps a *CredReq* for \$10.00)

request 2: $\langle xid_1, mid_m, tid_i, rrp_{id_2}, reqdate_2, reqdata_1 \rangle$ (perhaps a retry of above)

10 The *reqdates* are different in both cases because the date is generated along with the *rrpid* to thwart replay attacks. In this example the Gateway will not be able to determine whether the second *CreditReq* should be performed or whether it is simply a retry to **request 1** with *rrpid*₁. The Gateway must know whether or not to apply a new credit or to deliver a response that it may already have from the host (it may
15 have come too late for the first attempt or have been lost on the way to vPOS). If no response was logged from the host for **request 1**, the Gateway could repeat its original request to the host when receiving **request 2**. In a sense, the Gateway will act as an **intelligent request/response cache**.

20 The Gateway splits the *rrpid* number space into two parts. One main part that will remain the same for the same request across all its retry attempts and a smaller portion to indicate the number of retry attempts. Then,

25
$$rrpidRetryCount = rrp_{id} \text{ MOD } MAXRETRIES \text{ (0 for initial request, } >0 \text{ for a retry)}$$

NOTE : The initial *rrpids* generated by vPOS software are equal to 0 MOD MAXRETRIES and in subsequent retries the lower order digits are incremented by one for each retry attempt. This requires extra stored in the vPOS application. The
30 vPOS software must persistently store the *rrpid* used (which contains the retry count of the transaction) so that repeated attempts will follow the correct semantics.

In general the Gateway will support the following logic [assuming the second request is fresh and not a replay attack]:

35 If two requests,

request 1 : $\langle xid_1, mid_m, tid_i, rrp_{id_1}, reqdate_1, reqdata_1 \rangle$

request 2 : $\langle xid_1, mid_m, tid_i, rrp_{id_2}, reqdate_2, reqdata_1 \rangle$

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are received at t_1 and t_2 (where $t_2 > t_1$) and,

$$(\text{rrpid}_1 - (\text{rrpid}_1 \text{ MOD MAXRETRIES})) = (\text{rrpid}_2 - (\text{rrpid}_2 \text{ MOD MAXRETRIES}))$$

then the Gateway will interpret the second request as a retry request.

But if,

$$5 \quad (\text{rrpid}_1 - (\text{rrpid}_1 \text{ MOD } 100)) \neq (\text{rrpid}_2 - (\text{rrpid}_2 \text{ MOD MAXRETRIES}))$$

then the Gateway will interpret the second request as a new request.

10 In addition to being able to distinguish between a retry and a new request, the proposed *rrpid* scheme can be used to determine how many vPOS requests got lost in the Internet. This is a useful value-added service for system management.

Robustness and Error Handling Issues

There are several robustness issues that need to be addressed. The basic flow is that vPOS sends a request to the Gateway, the Gateway logs the SET key fields from the incoming attempt in the database. The Gateway then generates a host request
 15 which it logs completely in the database. The host handles the request and generates a response that is directed towards the Gateway which, when received is logged completely in the Gateway database. Finally the Gateway generates an SET response to vPOS, the contents of which is not logged in the database.

20 If the Gateway has not received the request or receives the request but is not able to log the request in the database it is easily handled by a vPOS retry attempt. This recovery action needs no further discussion. In general, if the vPOS does not receive a reply to a request it has sent to the Gateway it must retry persistently until a response is received. All retry attempts from vPOS for the same request must have
 25 the same base portion of the *rrpid* but a different value in the retry counter.

The Gateway must handle replay attacks as outlined previously in this document. If the Gateway receives a request that it has already received from vPOS there could be several possible dispositions:

- 30 a) the request had already been handled completely with the host and a host response is in the Gateway database. In this case the Gateway can simply translate the host response to a SET response and send it to vPOS.
- 35 b) the request had been sent to the host before (as determined by a database field) but a response from the host is not on file. In this case the Gateway must retry the host request.

If the vPOS times-out for any reason, it must retry later using an *rrpid* that indicates a retry attempt. If the Gateway receives a late-response (after vPOS has given up) it simply logs it in the database for that retry attempt (if no retry attempt for the transaction is still outstanding at the host). There is a glare situation where
5 the original response could arrive so late that it could be confused with the response from a currently outstanding retry attempt with the host. This situation is logged and the first response not sent back to vPOS.

A response from the host indicating a successful transaction may get lost on the way
10 back to the Gateway or not be able to be logged in persistent storage in the Gateway. In either case vPOS is in a situation where the retry request when received by the host may result in a response from the host indicating that the request is a duplicate. The vPOS software must be able to handle this. In the LEGACY case
15 when a duplicate post is received by the host the second one automatically causes the first one to void and the second transaction fails too. In this case vPOS should retry the transaction under a new *rrpid*. If the transaction goes through end-to-end all effects of the previous transactions will not matter.

TokenOpaque Contents

20 The Gateway requires information captured at the time of an *AuthReq* that must be repeated to the host at the time of the associated *CapReq*. The mechanism of choice (built into SET) for this is enabled utilizing this data in the *TokenOpaque* token of the *CapToken* which is sent in an *AuthRes*. This *CapToken* is stored at the Merchant system and represented to the Gateway at the time of the *CapReq*. The format of an
25 *TokenOpaque* is an *OctetString*.

The following data structure is utilized to deliver the AVS data. \

```
30      StreetAddress1=800 El Camino Real\n
      StreetAddress2=Suite 400\n
      City=Menlo Park\n
      StateProvince=CA\n
      Country=USA\n
      PostOfficeBox=\n
35      ZipPostalCode=94025\n
      \n
```

An empty line indicates the end of *AVSData*.

The detailed information that is available for the Address Verification Service depends on the Payment Window that captures the data from the consumer.

5 AVS Data (LEGACY-only)

For "LEGACY" version "1.0" only the *ZipPostalCode* name value pair is required. The Gateway will only use the first 5 characters of this value.

Transaction Replay Attacks

- 10 The processing of Internet-based payment transactions is a coordinated interaction between the Internet Transaction Gateway and the vPOS servers that is based on the following principles. A vPOS terminal, as the initiator of the payment transaction, is responsible for the round-trip logical closure of the transaction. vPOS will retry a transaction that has been initiated with the Gateway but where the response for the
- 15 request was never received from the Gateway. A vPOS terminal selects -- out of a pre-assigned range -- a ***Terminal-Id*** that is to be used by the Gateway in a request to the host processor. This data element must be transported from the vPOS to the Gateway along with the payment-related information. The ***Terminal-Ids*** must be unique among the concurrent vPOS instances on a vPOS server system. However,
- 20 the ***Terminal-Ids*** have no history. For example, a subsequent Force Post transaction need not use the same ***Terminal-Id*** as the original Authorization transaction. The vPOS will be responsible for making sure that only one request is outstanding for the same ***<Merchant-id, Terminal-id>*** data elements from a vPOS server system. The Gateway does not know that a response was successfully
- 25 received by vPOS. This means that the vPOS must be responsible for initiating any retry attempts. The Gateway never initiates a retry attempt with the host processor without an explicit retry request from vPOS. The Gateway when asked to retry a request with the host, performs a relational database look-up and delivers a response that has already been received from the host processor but was previously
- 30 missed by vPOS. This behavior of the Gateway is also known as the "transaction response cache." The Gateway will need to know that a vPOS request is a retry of something already sent. The prior request may or may not have been received. A solution for determining the difference between a retry attempt and a new request was described earlier in this document. vPOS must understand the "canonical" error
- 35 codes that it will receive via the Gateway and be able to initiate the proper recovery action and/or generate the appropriate user-interface dialog.

Certificate Processing

Merchants require a mechanism for verifying legitimate cardholders is of valid, branded bankcard account numbers. A preferred embodiment utilizes technology to link a cardholder to a specific bankcard account number and reduce the incidence of fraud and thereby the overall cost of payment processing. Processing includes a mechanism that allows cardholder confirmation that a merchant has a relationship with a financial institution allowing it to accept bankcard payments. Cardholders must also be provided with a way to identify merchants they can securely conduct electronic commerce. Merchant authentication is ensured by the use of digital signatures and merchant certificates. In a preferred embodiment, a holder of a payment instrument (cardholder) surfs the web (Internet) for required items. This is typically accomplished by using a browser to view on-line catalog information on the merchant's World Wide Web page. However, order numbers can be selected from paper catalogs or a CD-ROM and entered manually into the system. This method allows a cardholder to select the items to be purchased either automatically or manually. Then, the cardholder is presented with an order form containing the list of items, their prices, and totals. The totals could include shipping, handling and taxes for example. The order form is delivered electronically from the merchant's server or created on the cardholder's computer by electronic shopping software. An alternative embodiment supports a negotiation for goods by presenting frequent shopper identification and information about a competitor's prices. Once the price of goods sold and the means of payment has been selected, the merchant submits a completed order and the means for payment. The order and payment instructions are digitally signed by cardholders who possess certificates. The merchant then requests payment authorization from the cardholder's financial institution. Then, the merchant sends confirmation of the order, and eventually ships the goods or performs the requested services from the order. The merchant also requests payment from the cardholder's financial institution.

Figure 1C is a block diagram of a payment processing system in accordance with a preferred embodiment. The Certificate Issuance at the Bank Web Site 162 resides at the bank web site 182. It is utilized for issuing SET complaint / X.500 certificates to consumers. The implementation of this system may vary from one bank to another. However, the system gathers consumer's personal information, and after processing the information, the system issues a certificate along with a payment instrument to the consumer. The Single Account Wallet 160 at the bank web site 182 represents the MIME message that is created by the Certificate Issuance system. This MIME

message contains a VeriFone wallet. The VeriFone wallet contains a single payment instrument and the certificate associated with it. For security reasons, the private key is not included in the wallet. The has to specify a private key before using the instrument for payment. When the consumer is issued the certificate, this MIME
5 message is sent to the browser. The browser launches the Certificate Installation application **174, 144** which is defined as a helper application in the browser. The Certificate Installation application **174, 144** reads the MIME message and install the wallet into the wallet database **158**.

10 Various helper applications **198, 172, 174, 176** are provided to make the consumer's shopping experience easy and efficient including the following helper applications. The Paywindow helper application **188** is utilized by the consumer to authorize the payment to the merchant, to administer their wallets, to review their previously completed payment transactions and to perform housekeeping activities
15 on the wallets. This application is defined as a 'helper' application on the consumer's desktop. The browser launches this application when the merchant system sends a MIME message requesting payment. The PayWindow Setup Helper application **172** is used by the consumer to install helper applications and other modules from the web site onto the consumer desktop. When a consumer attempts to install an
20 application for a first time, the consumer does not have a helper application on the desktop. Thus, the first time installation of an application requires a consumer to perform two steps. First the user must download the system package to their desktop and then the user must run setup to decompress and install the system. Thereafter, whenever the consumer gets a new release of system software, the
25 browser launches this helper application which in turn installs the appropriate other system modules.

The Certificate Installation Helper Application **174** is utilized to install a wallet that is issued by a bank. When the bank's certificate issuance web system sends the
30 MIME message containing the VeriFone wallet, the browser launches this application. This application queries a consumer to determine if the payment instrument contained in the wallet is to be copied to an existing wallet or to be kept in the new wallet. This application then installs the payment instrument and the certificate into the wallet database **158**. The Certificate Issuance CGI scripts **162**
35 and the Single Account Wallet **160** at the Bank Web Site **182** is processed as described in the native system. The Certificate Installation Applet of the Bank Web

Site **182** is utilized by the Certificate Issuance CGI scripts **162** system to deliver a consumer's certificate to the consumer's desktop.

Figure **26** is an architecture block diagram in accordance with a preferred embodiment of the subject invention. Processing commences at function block **2600** where the Graphical User Interface (GUI) part of the application is initialized. The GUI application **2600** provides the consumer with support for ordering and making payments during the shopping process. There are also GUI components provided for wallet creation; importing, certificate and payment method creation and maintenance; and for transaction register review and reporting. The screen designs, and their associated logic, for the helper applications and applets are individually discussed in detail below. The Certificate Manager **2604** manages the automatic downloading of a consumer's certificate from a bank, validation of a consumer's and a merchant's certificates and automatic requisition of certificate renewal. The Payment Manager **2606** coordinates and completes the payment request that is received from the merchant system. The payment request is received via a MIME message in the native code implementation or via an applet in the Java implementation. The payment request received contains the final GSO, Ship-To name, merchant certificate, merchant URL, coupons and the payment amount. The manager **2606** then communicates with the payment related GUI component to interact with the consumer to authorize and complete the payment transaction. The manager is also responsible for determining the payment protocol based on the consumer's payment instrument and the merchant's preferred payment protocol. The manager **2606** includes a well defined Application Programming Interface (API) which enables OEMs to interface with the payment manager **2606** to make payments to specific HTTP sites. The detailed logic associated with the payment manager **2606** is presented in Figure **27**. The payment manager **2606** enforces standard operations in the payment process. For example the receipt and the transaction record can automatically be transferred to the Wallet file once the payment is completed. The payment manager architecture in accordance with a preferred embodiment is presented in Figure **27**. A user interfaces with the payment manager **2730** via a user interface **2700** that responds to and sends a variety of transactions **2710**, **2708**, **2706**, **2704** and **2702**. The transactions include obtaining the next record, payment record, receipt, acceptance of the payment instrument and GSO components. In turn, the payment manager **2730** sends transactions **2714** and receipts **2720** to the wallet manager **2722** and receives payment instruments, certificates and private keys from the wallet manager **2722**.

The payment manager **2730** also sends and receives transactions to the protocol manager **2770** including a merchant's payment message **2760**, a consumer certificate and PK handle **2750**, a merchant URL **2742**, a payment **2740**, a signed receipt **2734** and a GSO, Selected Payment Protocol and Selected Payment Instrument **2732**. The payment manager **2730** also accepts input from the payment applet or MIME message from the merchant as shown at function block **2780**. One aspect of the payment processing is a Consumer Payments Class Library (CPCL) **2770** which encapsulates the payment protocols into a single API. By encapsulating the payment protocols, applications are insulated from protocol variations. A SET Protocol provides an implementation of the client-side component of the Secure Electronic Transaction (SET) Protocol. A complete implementation of the client-side component of the CyberCash micro-payment protocol is also provided.

The Wallet Manager **2722** provides a standard interface to the wallet. It defines the wallet database structures and the payment instrument data structures, controls the access to the wallet and provides concurrency checking if more than one application attempts to open the same wallet. The interface to the wallet manager **2722** is published to allow OEMs to interface with the wallet manager and access the wallet database.

The wallet manager consists of the following sub-components:

Wallet Access. This component provides an interface to read and write wallet information.

Transaction Manager. This component provides an interface to read and write transaction corresponding to a wallet into the wallet database.

Payment Instrument Manager. This component manager provides a common interface to the specific payment instrument access components.

Credit Card Access, Debit Card Access, Check Access. These components deal with a specific payment instrument.

A Data Manager provides storage and retrieval of generic data items and database records. It is assumed that data fields, index fields or entire data records can be marked as encrypted and the encryption process is largely automated. The data manager has no specific knowledge of database records appropriate to different payment methods. This layer is separated out so as to reduce changes required when new payment methods are introduced. However RSA key pairs and certificates might be considered as "simple" data types. This component also provides an

abstraction which supports wallet files on computer disk or contained in smart cards.

5 The Open Data Base Connectivity (ODBC)/Java Data Base Connectivity (JDBC) component provides Data Base Connectivity where formal database components are required. An embodiment of the Smart Card Wallet allows wallet data to be stored and/or secured by a cryptographic token.

10 A preferred embodiment includes a single file or directory of files comprising a "wallet" which contains personal information and information about multiple payment methods with the preferred implementation. These payment methods (Visa cards, debit cards, smart cards, micro-payments etc.) also contain information such as account numbers, certificates, key pairs, expiration dates etc. The wallet is envisaged to also contain all the receipts and transaction records pertaining to every
15 payment made using the wallet. A Cryptographic API component provides a standard interface for RSA and related cryptographic software or hardware. This support includes encryption, signature, and key generation. Choice of key exchange algorithm, symmetric encryption algorithm, and signature algorithm should all be configurable. A base class stipulates generic behavior, derived classes handle
20 various semantic options (e.g. software based cryptography versus hardware based cryptography.)

The Cryptographic Software portion provides RSA and DES support. This may be provided utilizing the SUN, RSA or Microsoft system components depending on the
25 implementation selected for a particular customer. Cryptographic Hardware creates a lower level API which can underpin the Cryptography API and be utilized to replace Cryptography Software with an off the shelf cryptography engine. The message sequence charts describe the flow of messages/data between the consumer, the browser and/or the various major components of the Semeru system. The major
30 components of the system are the Merchant system which includes the vPOS, the PayWindow, and the Payment Gateway. The merchant system allows a consumer to shop, accept the payment transactions sent by the PayWindow application, and send payment transactions to the acquiring bank. The Consumer Payments Class Library (CPCL) module is a layer within the application which sends the payment
35 transactions, securely, from the consumer to the merchant.

Figure 28 is a Consumer Payment Message Sequence Diagram in accordance with a preferred embodiment of the invention. The diagram presents the flow of messages between the consumer, the browser, the merchant system, the PayWindow application, and CPCL. This message flow describes the payment process from the time an order is completed and the consumer elects to pay, to the time the payment is approved and the receipt is returned to the consumer. The difference between the Native implementation and Java implementation of the PayWindow application is in the delivery of the order information to the PayWindow. Once the order information is received by the PayWindow, the flow of messages/data is the same for both implementations. In the case of the Native implementation, the order information is delivered via a MIME message. This MIME message is sent to the PayWindow by the browser via a document file. In the Java implementation, the order information is delivered to the PayWindow by an applet. The merchant system sends an applet with the order information to the browser which in turn delivers the order to the PayWindow. Once the order is received, the PayWindow interacts with the consumer and the Protocol modules for the completion of the payment process.

Enters Order and Clicks Calculate Order 2820

This message represent the consumer order entry and the clicking of the 'Calculate Order' button. The consumer's shopping experience is all condensed into this one message flow for the purpose of highlighting the payment process. The actual implementation of the shopping process varies, however, the purpose does not, which is the creation of the order.

Order 2830

This message represents the order information which is sent by the browser to the merchant via an HTML form.

Payment Applet with GSO, PPPs, AIs, merchant certificate and URL 2840

On receipt of the order, the merchant system calculates the payment amount. This message represents the HTML page which is sent by the merchant system detailing the payment amount along with the Java payment applet which contains the GSO, PPPs, AIs, merchant certificate and URL.

Run Payment Applet 2845

The Java enabled browser runs the Payment applet. The applet displays a button called "Pay" for the consumer to click. This is embedded in the HTML page delivered by the merchant.

Clicks Pay 2850

This message represents the clicking of the Pay button on the browser by the consumer after confirming the payment amount.

GSO, PPPs, AIs, merchant certificate and URL 2860

This message represents the GSO, PPPs, AIs, merchant certificate and the merchant URL carried by the Java applet. The Java applet now delivers these to the PayWindow application.

5 Merchant certificate 2862

This message represents the merchant's certificate which is sent to the CPCL module for checking the validity of the merchant.

Merchant's validity 2864

10 The CPCL modules examines the merchant's certificate and send this message to the PayWindow indicating whether or not the merchant is a valid merchant.

Wallet, Payment Instruments 2866

This message represents the wallets and payment instruments that is displayed to the consumer. Not all payment instruments from a wallet is shown to the consumer. Only the ones accepted by the merchant is shown.

15 Payment Instrument 2868

This message represents the payment instrument selected by the consumer. This message is created in the current design when the user double clicks on the payment image in the "Select Payment Method" Window.

GSO 2870

20 This indicates that the GSO is displayed to the consumer in the "Make Payment Authorization" screen.

Authorization of Payment 2872

25 This message represents the authorization of the payment by the consumer. The consumer authorizes the payment by clicking the 'Accept' button on the "Payment Authorization" screen.

Decide Payment Protocol 2874

Once the consumer authorizes the payment, the payment protocol is decided by PayWindow based on the merchant's Payment Protocol Preferences and the consumer selected payment instrument.

30 Payment Authorization 2875

These messages represent the merchant's URL, the GSO, payment protocol (PP) to use, account number, certificate and the private key handle (PK) associated with the payment instrument which is sent to the protocol module.

GSO with Payment Authorization 2876

35 This message represents the payment instructions which is sent by the protocol module to the Merchant system. The GSO, PI, consumer certificate and PK is packaged based on the payment protocol.

Signed Receipt 2878

This message represents the digitally signed transaction receipt received by the protocol module from the merchant.

Save Receipt with hash value 2880

- 5 The digitally signed transaction receipt is saved by the PayWindow for future reference.

Payment Successful 2882

This indicates that the transaction receipt and the 'payment successful' have been displayed to the consumer.

10

Certificate Processing

A payment instrument must be certified by a "certificate issuing authority" before it can be used on a computer network. In the case of credit card payments, the issuer may be one of the card issuing banks, but it might also be a merchant (eg SEARS), a transaction acquiring bank or an association such as VISA or Mastercard. Payment instrument information is stored in the consumer's wallet. The certificate which authorizes the payment instrument will be stored along with that data in a secured database. The process of acquiring a certificate is described below. A certificate can be delivered to a consumer in a preconfigured wallet. The consumer receives a wallet which contains the certificate together with the necessary details associated with a payment instrument including a payment instrument bitmap which is authorized by a certificate issuing authority or the agencies represented by the issuing authority.

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Obtaining a certificate

- 25 A consumer will deliver or cause to be delivered information to a certificate issuing authority. Figure 29 is an illustration of a certificate issuance form in accordance with a preferred embodiment. A user may fill out the form on-line, on paper and mail it in, or get his bank or credit card company to deliver it. The consumer delivered data will usually contain a public key belonging to a security key pair generated by consumer software. This information will normally be mailed to the consumer's address and actuated by a telephone call from the consumer. The certificate authority takes this information and uses it to validate that he is indeed entitled to use the payment method. This processing normally takes a few days to accomplish. Information will normally be exchanged with the organization issuing the payment method in the physical space if there is one, and with credit agencies. The certificate information is loaded into the consumer's software to enable payment processing to proceed online. In some cases the consumer will be able to select

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- details about a payment instrument holder (wallet) he desires to own. This may be the icon representing a holder, the access password or other information. After creating the certificate, the issuing authority can use information received in the certificate application to create a custom payment instrument holder ready to use.
- 5 This payment instrument holder will contain the following information. Payment instrument information including card number **2900** and expiration date **2902**. Personal information including name **2904**, address **2906**, social security number **2908** and date of birth **2910**. The associated certificate (eg X509 standard), an associated public key or in some cases public/private key pair (eg RSA), and an
- 10 approved bitmap representing the payment instrument are provided to the requesting consumer. Figure **30** illustrates a certificate issuance response in accordance with a preferred embodiment. An approved bitmap for a VISA card is shown at **3000**. Also a default payment holder **3010** and a default payment holder name are provided with the certificate issuance. After the consumer acquires the
- 15 payment instrument holder **3010**, the payment instrument holder is immediately visible to him in his collection of payment instrument holders. Figure **31** illustrates a collection of payment instrument holders in accordance with a preferred embodiment. The predefined payment instrument holder **3100** is the same JOHN's WALLET that was predefined based on defaults by the certificate issuance form.
- 20 Figure **32** illustrates the default payment instrument bitmap **3200** associated with the predefined payment instrument holder **3210** resulting from the consumer filling in and obtaining approval for a VISA card. Figure **33** illustrates a selected payment instrument with a fill in the blanks for the cardholder in accordance with a preferred embodiment. Next time the payment instrument holder is opened in a payment
- 25 context the certificate issuing authority's approved instrument bitmap can be used to select the payment instrument and utilize it to make purchases. Figure **34** illustrates a coffee purchase utilizing the newly defined VISA card in accordance with a preferred embodiment of the invention.
- 30 Figure **35** is a flowchart of conditional authorization of payment in accordance with a preferred embodiment. Processing commences at **3500** where the program initializes the connection between the cardholder and the merchant for the purposes of shopping. After the cardholder completes shopping, a new SSL connection is established which provides authenticating information to the merchant. At this point
- 35 the merchant is able to execute payment functionality (based on SSL or SET) conditionally, based upon the quality and character of the digital signature and the certificate used to validate said signature. Then, at function block **3510**, the

cardholder selects the payment instrument for the particular transaction. Payment instruments could include VISA, MASTERCARD, AMERICAN EXPRESS, CHECK, SMARTCARD or DEBIT CARDS. The payment method is then submitted to the merchant at function block 3520. The merchant then initializes the SET connection to the acquiring bank at function block 3530 if the connection is not already established. Then, at function block 3540, the certificate is submitted to the merchant from the acquiring bank. The certificate includes a public key portion and a private key used as an irrefutable digital signature to authenticate the parties to the transaction. The certificate also includes information on the level of credit risk which allows a merchant to conditionally decide on the authorization or rejection of credit under a particular payment instrument based on their risk level and the merchant's personal comfort level with the ability of the cardholder to pay. This processing has not previously been possible because the information returned from the authorizing bank did not include a level of credit risk a cardholder posed, it only contained credit rejected or approved. A detailed description of the gateway internals is presented below in accordance with a preferred embodiment.

Gw ClearSetRequestHandler

Figure 51 depicts a flow diagram for the GatewayClearSetRequestHandler routine. Execution begins in Step 5105. In Step 5110 an SET analysis routine is called to analyze the SET request, as will be more fully disclosed below. Step 5110 sets a status flag indicating the next stage to be performed by the Gateway. In Step 5120 the Gateway checks to see whether the status is set to indicate that a response should be provided to the user. If so, execution proceeds to Step 5190, which ends the request handling routine and returns control to a calling routine, which then provides a response to the user. Otherwise execution proceeds to Step 5130. In Step 5130, the Gateway checks to see if the status is set to indicate that forward translation is required. Forward translation is necessary to translate an outgoing message into a format that can be understood by the host computer. If forward translation is indicated, execution proceeds to Step 5135. In Step 5135, the outgoing message is forwarded translated, as more fully disclosed below with respect to Figure 53. If no forward translation is indicated, for example, if an already-translated transaction is being retried, execution proceeds to Step 5140. In Step 5140, the Gateway checks to see if the next step is communication to the host. If so, the Gateway proceeds to Step 5145, and initiates host communication as will be more fully discussed below with respect to Figure 54. If not, execution proceeds to Step 5150. In Step 5150, the Gateway checks to see whether reverse translation is

indicated. Reverse translation translates a response from a host into a format useable by the calling routine. If reverse translation is indicated, execution proceeds to Step 5155, and the reverse translation is performed, as will be more fully discussed below with respect to Figure 55. In any case, after either forward
5 translation in Step 5135, host communication in Step 5145, or reverse translation in Step 5155, control returns to Step 5120 for further processing. As will be more fully disclosed below, the forward translation, host communication, and reverse translation routines manipulate status indicators to prevent the occurrence of an infinite loop.

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AnalyzeSetRequest

Figures 52A and 52B describe the AnalyzeSetRequest routine. This routine is by Step 5110 as illustrated in Figure 51. Execution begins in Step 5200. In Step 5205 the various fields in the SET record are obtained, as will be more fully
15 disclosed below with respect to Figures 56A and 56B. In Step 5210 the Gateway checks the retry count. A retry count is zero indicates that the request being analyzed is a new request, and control proceeds to Step 5212, indicating a new request. If the retry account is non-zero, this means that the request is a retry of a prior request, and control proceeds to Step 5214 where a retry is indicated.

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Following either step 5212 or 5214, execution proceeds to Step 5215. In Step 5215 the Gateway checks to see whether the request represents a "stale request," as will be more fully described below with respect to Figure 57. In Step 5220, the Gateway tests the result of the stale check from Step 5215. If the request is stale it is
25 marked as stale in Step 5222. Otherwise the record is marked as not stale in Step 5224. Following either Step 5222 or Step 5224, control proceeds to Step 5230. In Step 5230 a message representing the SET request is inserted into the database for tracking purposes, and control proceeds to Step 5240.

30 In Step 5240 the Gateway checks to see if the request had been marked stale in Step 5222. If so, it proceeds to Step 5242, exiting with an error condition. In Step 5245, the Gateway attempts to retrieve from the database a message corresponding to the current SET request, as will be fully disclosed below with respect to Figure 59. Step 5260 checks to see whether the message was successfully retrieved from the
35 database. If the message was not found in the database, this indicates that the SET request represents a new message, and control proceeds to Step 5270. In Step 5270 a new message representing the SET request is added to the database, as is

more fully disclosed below with respect to Figure 60. Because this is a new request, it must be processed from the beginning, including forward translation. Therefore, after the new message is added in Step 5270, control proceeds to Step 5275. In step 5275, where a status flag is set indicating that the next step to be performed for this message is for translation. If the message was found in Step 5260, this indicates that the request represents a request that is already in progress. Therefore, control proceeds to Step 5280 to update the database with current information representing the request status. The update process is described in further detail with respect to Figure 61, below. Following Step 5280, control proceeds to Step 5282. In Step 5282 the Gateway checks to see the disposition in which the SET request was left as a result of partial processing. This is done, for example, by interrogating fields in the database record that indicate the steps that have already been performed for this request. In Step 5283, based upon this status information, the Gateway indicates the next stage of processing to be performed: either forward translation, reverse translation, or communication with the host. After this status has been set, whether for a new request in Step 5275, or for an already-existing request in Step 5283, control proceeds to Step 5290, which exits the AnalyzeSetRequest routine, returning control to Step 5110 in Figure 51.

20 TranslateForward

Figure 53 depicts the execution of the TranslateForward routine, which is called by Step 5135 in Figure 51. Execution begins at Step 5310. In Step 5320, the Gateway forward-translates the request to prepare it for transmission to the host. Forward translation consists of packaging the fields in the request into a format that is understandable by the legacy system at the financial institution. The exact format of the translated request will vary from institution to institution. However, in general, the format will consist of a fixed length record with predetermined fields, using a standard character set such as ASCII or EBCDIC. In Step 5330, the Gateway checks to see whether the translation was successfully performed. If not control proceeds to Step 5340, which returns an error condition. If the translation was successful, control proceeds to Step 5350. In Step 5350, the Gateway sets a status flag to indicate that the next stage to be performed for this SET request is to proceed to host communication. This will be used in the next iteration of the Gw_ClearSetRequestHandler routine as depicted in Figure 51. After the status is set in Step 5350, the translate forward routine returns control in Step 5360.

The TranslateForward routine as depicted in Figure 51 may be implemented using the following C++ code:

```

    gwAction CGW_Engine::TranslateForward(CPCLCCRequest *pVehicle)
    {
        gwRC      rc;
5        gwDBRC   dbrc;

        rc = HM_TranslateForward(m_hostSpecificMessage, pVehicle);

        if (rc == GW_SUCCESS) {
10            return (GW_PROCEED_WITH_HOST_COMMS);
        }

        m_hostRequestDisposition = GW_HREQDI_FWD_XLAT_FAILED;
        BuildSetErrorResponse(pVehicle, ISO_RESP_FORMAT_ERR);

15        dbrc = Gwdb_UpdateHostMsgRequestDisp();
        if (dbrc != GWDB_SUCCESS) {
            GW_LogError( LOG_ERR,
20            "Gwdb_UpdateHostMsgRequestDisp() : %d", dbrc);
        }

        return (GW_PROCEED_TO_RESPOND);
    }

```

25 **DoHostCommunication**

Figure 54 depicts the step of host communication, as shown in Step 5145 in Figure 51. Execution begins in Step 5400. In Step 5405 the Gateway obtains from the request object the string representing the request text. In Step 5410 it obtains the sequence number for the request. In Step 5415 the Gateway determines the current time, in order to record the time at which the request is made. In Step 5420 the Gateway sends the request to the host and waits for a response from the host. When a response is received, execution continues in Step 5425. In Step 5425, the Gateway again checks the current time, thereby determining the time at which a response was received. In Step 5430, the Gateway checks to see whether the communication was successfully performed. If a communication was not successful, the Gateway records that an error occurred in Step 5432. If the communication was successful, the Gateway, in Step 5435, indicates that the request was successfully

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sent and responded to. In Step 5437, the Gateway sets the response string based upon the response received in Step 5420. In Step 5439 the Gateway sets a status to indicate that reverse translation of the received response is required. Regardless of whether the communication was successful or unsuccessful, execution continues to Step 5450. In Step 5450, the database is updated with status information from the host communication. In Step 5490, control is returned to the calling routine.

TranslateReverse

Figure 55 depicts the operation of the TranslateReverse routine, as executed in Step 5155 in Figure 51. Execution begins at Step 5500. In Step 5510 the Gateway reverse-translates the response received from the legacy system host. Reverse translation consists of extracting data from the data records received from the legacy system, and placing them in objects so that they are useable by the Gateway. In Step 5520, the Gateway checks to verify that translation was successful. If translation was successful control proceeds to Step 5530, where a status flag is set indicating a successful translation. If translation was not successful, control proceeds to Step 5540, in which the Status Flag is set to indicate an unsuccessful translation. Regardless of whether translation was successful or unsuccessful, execution proceeds to Step 5550. In Step 5550, a status flag is set to indicate that the next stage for the request is to provide a response from the Gateway. This step is always executed, because, regardless of whether the translation or any other aspect of the transaction was successful, a response indicating either success or failure must be returned by the Gateway. Control then proceeds to Step 5590, in which the TranslateReverse routine returns control to the calling routine in Figure 51. It will be seen that the TranslateForward routine in Figure 53, the DoHostCommunication routine depicted in Figure 54, and the TranslateReverse routine depicted in Figure 55, each alter the status of the request. As a result as the loop depicted in Figure 51 executes a particular request will proceed through all three stages and finally to exit in Step 5190.

GetSetKeyFields

Figures 56A and 56B describe the GetSetKeyFields routine. This routine is called by Step 5205 as illustrated in Figure 52A. Execution begins in Step 5600. In Step 5610, the Gateway interrogates the request object to determine the request type. In Step 5620, the Gateway determines whether the request type is for authorization only. If the request type is not for authorization only, execution proceeds to Step

5625. In Step **5625**, the Gateway checks to see whether the request type is for a sale. If the request type is neither for authorization only nor for a sale, execution proceeds to Step **5630**. In Step **5360**, the Gateway indicates that the request type is not a supported request, and proceeds to Step **5635**, where it returns to the caller.

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If the request type is either for authorization only or for a sale, execution proceeds with Step **5640**. In step **5640**, the Gateway initializes a container object to represent the request. In Step **5650**, the Gateway extracts the [transaction identifier?] (XID) for the transaction. In Step **5652**, the Gateway extracts the merchant identifier (MID) for the transaction. In Step **5654**, the Gateway extracts the [what is the RRPID?] (RRPID) and the terminal identifier (TID) for the request. In Step **5656**, the Gateway extracts the retry count associated with the current request. In Step **5660**, a message data area is initialized with the extracted contents. The message area can then be used for further processing by the called routine. In Step **5690**, the GetSetKeyFields routine returns control to the caller.

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Gwdb_IsSetMsgStale

Figure **57** depicts the Gwdb_IsSetMsgStale routine. This routine is called by Step **5215** as illustrated in Figure **52A**. Execution begins in Step **5700**. In Step **5710**, the Gateway checks to see whether this is the first time the Gwdb_IsSetMsgStale has been called for this request. If this is the first time, Steps **5715** through **5730** are performed; otherwise those steps are skipped. In Step **5715**, a field representing the message life is initialized to a predetermined duration. The message life is a field that will be used to determine how long the message representing the transaction will remain valid. The use of the message life field prevents a transaction that is effectively lost due to extensive processing delays from being processed. In Step **5720**, the Gateway checks to see if the value of the message life is equal to zero. If the message life is equal to zero, a default value, i.e., 300 seconds or 5 minutes, is assigned to the message life in Step **5725**. In Step **5730**, an indicator for this request is set to indicate that first time processing has already been performed for this request. This flag is the same flag interrogated in Step **5710**, and is used to prevent successive reinitialization of the message life field.

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In Step **5740**, the Gateway checks to see whether the merchant's time stamp, plus the value of the message life, is less than the time of the request. If so, then the request is considered stale, and is marked stale in Step **5750**. If not, the request is not stale, and is marked not stale

in Step 5755. Following either of Step 5750 or 5755, the Gwdb_IsSetMsgStale exits in Step 5790.

Gwdb_InsertSetMsg

- 5 Figure 58 depicts the Gwdb_InsertSetMsg routine. This routine is called from Step 5230 as illustrated in Figure 52A. Execution begins in 5800. In Step 5810, the routine invokes a database insert function by, for example, executing an SQL INSERT command. In Step 5820, the database return code is obtained in order to be used as a return code from the Gwdb_InsertSetMsg routine. In Step 5830, a
10 database commit function is performed, thereby instructing the database engine to commit the database changes to a permanent recording, i.e., by writing the information to the file, and/or by journalizing the change made by INSERT function. In Step 5890, the routine returns control to the calling program.

Gwdb_GetHostMsg

- 15 Figure 59 depicts the Gwdb_GetHostMsg routine. This routine is called by Step 5245 as shown in Figure 52B. Execution begins in Step 5900. In Step 5910, the routine invokes a database select function by, for example, executing an SQL SELECT command. In Step 5920, the database return code is obtained in order to
20 be used as a return code from the Gwdb_InsertSetMsg routine. In Step 5930, the Gateway checks to see whether the database retrieve operation was successfully performed. If so, execution proceeds to Step 5935. In Step 5935, the Gateway sets a number of status variables from the values retrieved from the database records. This includes the time the request was made, the time a response was received, the
25 contents of the request string, the contents of the response string, and a sequence number for this request. In Step 5940, a commit operation is performed. [What is the point of a commit operation following a retrieval, as opposed to an insert or an update?] In Step 5900, control returns to the calling program.

Gwdb_InsertHostMsg

- 30 Figure 60 depicts the Gwdb_InsertHostMsg routine. This routine is called by Step 5270 as illustrated in Figure 52B. Execution begins in Step 6000. In Step 6010, the routine invokes a database insert function by, for example, executing an SQL INSERT command. In Step 6020, the database return code is obtained in order to
35 be used as a return code from the Gwdb_InsertSetMsg routine. In Step 6040, a commit operation is performed. In Step 6090, the routine returns control to the calling program.

Gwdb_UpdateSetMsgResponseInfo

Figure 61 depicts a flow diagram for the Gwdb_UpdateSetMsgResponseInfo routine. Execution begins at Step 6100. In Step 6110, the routine invokes a database update function by, for example, executing an SQL UPDATE command. In Step 6120, the database return code is obtained in order to be used as a return code from the Gwdb_UpdateSetMsgResponseInfo routine. In Step 6190, the routine returns control to the calling program.

- 10 Figure 62 is the main administration display for the Gateway in accordance with a preferred embodiment. A set of menu selections are presented at 6200 which will be described in more detail for each display. Figure 63 is a configuration panel in accordance with a preferred embodiment. The configuration panel provides access to management information for configuring a gateway management information
- 15 database. The Merchant Identifier (Mid) 6310 is a thirty character, alphanumeric field that uniquely defines a merchant. The Merchant Name 6320 is a fifty character, alphanumeric field, the Edit 6330 and Delete field 6340 are hyperlinks to detailed panels for modifying information in the management information
- 20 database. Figure 64 is a host communication display for facilitating communication between the gateway and the acquirer payment host. The IP Address Field 6410 contains the Internet Protocol address for communicating via TCP/IP to the Internet. The TCP logical port field 6430 uniquely identifies the port for accessing the Internet, and the SAVE field 6430 invokes storing of the host communication information in the database. Figure 65 is a Services display in accordance with a
- 25 preferred embodiment. This display initiates portions of the Gateway such as the host multiplexer 2130 of Figure 21. Figure 66 is a graphical representation of the gateway transaction database in accordance with a preferred embodiment. Each of the fields represents a portion of the internet database schema in accordance with a preferred embodiment.

30

CLAIMS

What is claimed is:

- 1 1. A method for communicating between a gateway, and an existing host
2 payment application, comprising the steps of:
 - 3 (a) establishing a communication link between the gateway and the host payment
4 application;
 - 5 (c) receiving a host message in response to a gateway transaction;
 - 6 (d) parsing one or more transaction response values from the host message;
 - 7 (e) mapping the one or more transaction response values to a canonical
8 response code; and
 - 9 (f) storing the canonical response code in a transaction log.
- 1 2. The method of claim 1, including the steps of;
 - 2 (g) establishing a communication link between the gateway and the server;
 - 3 (h) transmitting the canonical response code from the gateway to the server;
 - 4 (i) indexing a database with the canonical response code to obtain a message; and
 - 5 (j) displaying the message to an end user.
- 1 3. The method of claim 1, wherein the messages include payment administration
2 information.
- 1 4. The method of claim 1, wherein the messages include payment exception
2 information.
- 1 5. The method of claim 1, wherein the messages include payment result
2 information.
- 1 6. The method of claim 1, including the step of modifying the database without
2 impacting the system.
- 1 7. The method of claim 1, wherein the canonical response code provides support
2 for secure electronic protocol.

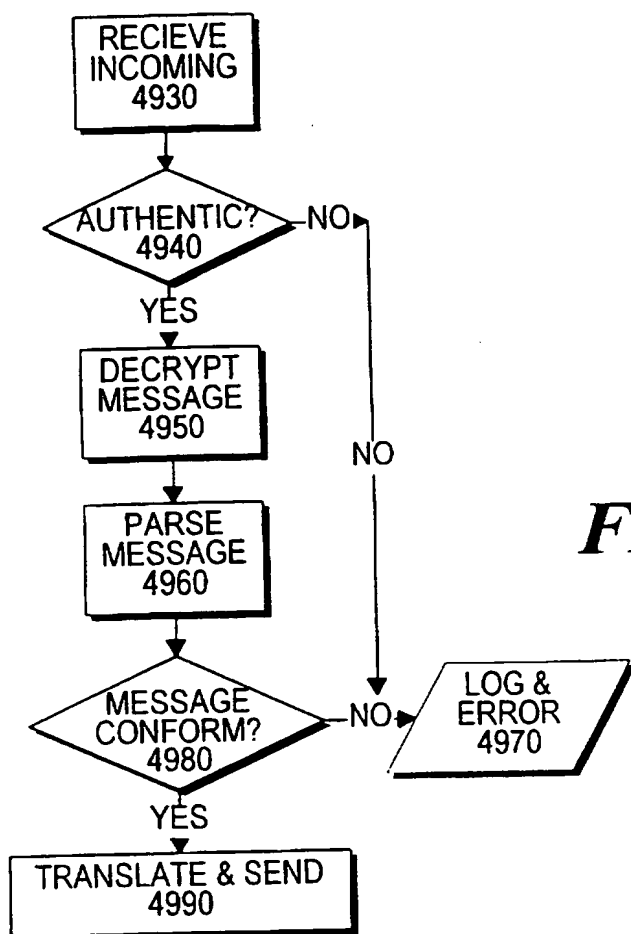
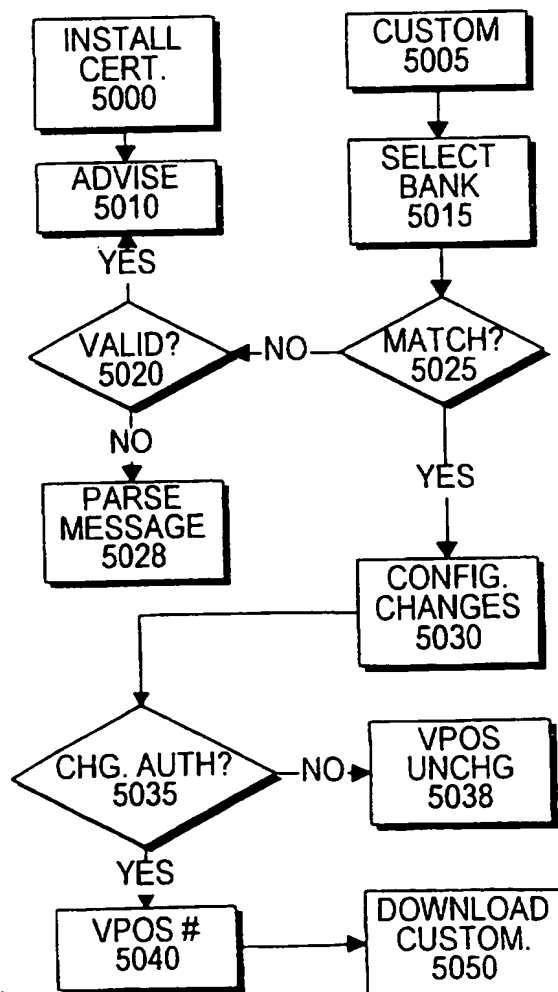
- 1 8. A method for communicating between a server, a gateway and a host as
2 recited in claim 1, including the steps of:
- 3 (a) establishing a first communication link between the server and the gateway;
4 (b) logging transaction information in a first transaction database at the server;
5 (c) transmitting a transaction from the server to the gateway over the first
6 communication link;
7 (d) establishing a second communication link between the gateway and the host;
8 (e) logging transaction information in a second transaction database at the
9 gateway;
10 (f) transmitting a transaction from the gateway to the host over the second
11 communication link;
12 (g) receiving a transaction response from the host;
13 (h) parsing the transaction response to obtain an index to the corresponding
14 logged transaction information in the second transaction database in the
15 gateway;
16 (i) updating the transaction response in the second transaction database in the
17 gateway with information from the response transaction from the host;
18 (j) transmitting the response transaction to the server over the first
19 communication link;
20 (k) parsing the transaction response to obtain an index to the corresponding
21 logged transaction information in the first transaction database in the server;
22 (l) updating the transaction response in the second transaction database in the
23 server with information from the response transaction from the host; and
24 (m) displaying payment information corresponding to the transaction on a
25 display.
- 1 9. The method of claim 8, including the step of the server detecting a transaction
2 response failure and resending the corresponding transaction from first
3 transaction database with appropriate modifications.
- 1 10. The method of claim 8, including the step of detecting a valid retry transaction,
2 retrieving information from the second transaction database at the gateway
3 and updating the transaction with previously received host transaction results
4 from the retrieved information before transmitting the transaction to the
5 server.

- 1 11. The method of claim 8, including the step of detecting an invalid transaction by
2 parsing a transaction to obtain a key and comparing the key to keys in the
3 second transaction database at the gateway, determining that a key from the
4 transaction is identical to a key in the second transaction database and
5 rejecting the transaction.
- 1 12. The method of claim 8, including the step of detecting a stale transaction by
2 comparing a time stamp field in the transaction to a current time and rejecting
3 the transaction if the differential exceeds a predefined value.
- 1 13. The method of claim 12, including the step of modifying the predefined value
2 dynamically.
- 1 14. The method of claim 8, including the step of providing support for a secure
2 electronic protocol.
- 1 15. An apparatus for communicating between a gateway, and an existing host
2 payment application, comprising:
3 (a) program means for establishing a communication link between the gateway
4 and the host payment application;
5 (c) program means for receiving a host message in response to a gateway
6 transaction;
7 (d) program means for parsing one or more transaction response values from the
8 host message;
9 (e) program means for mapping the one or more transaction response values to
10 a canonical response code; and
11 (f) program means for storing the canonical response code in a transaction log.
- 1 16. The apparatus of claim 15, including:
2 (g) program means for establishing a communication link between the gateway
3 and the server;
4 (h) program means for transmitting the canonical response code from the gateway
5 to the server;
6 (i) program means for indexing a database with the canonical response code to
7 obtain a message; and
8 (j) program means for displaying the message to an end user.

- 1 17. The apparatus of claim 15, wherein the messages include payment
2 administration information.
- 1 18. The apparatus of claim 15, wherein the messages include payment exception
2 information.
- 1 19. The apparatus of claim 15, wherein the messages include payment result
2 information.
- 1 20. The apparatus of claim 15, including program means for modifying the
2 database without impacting the system.
- 1 21. The apparatus of claim 15, wherein the canonical response code provides
2 support for secure electronic protocol.

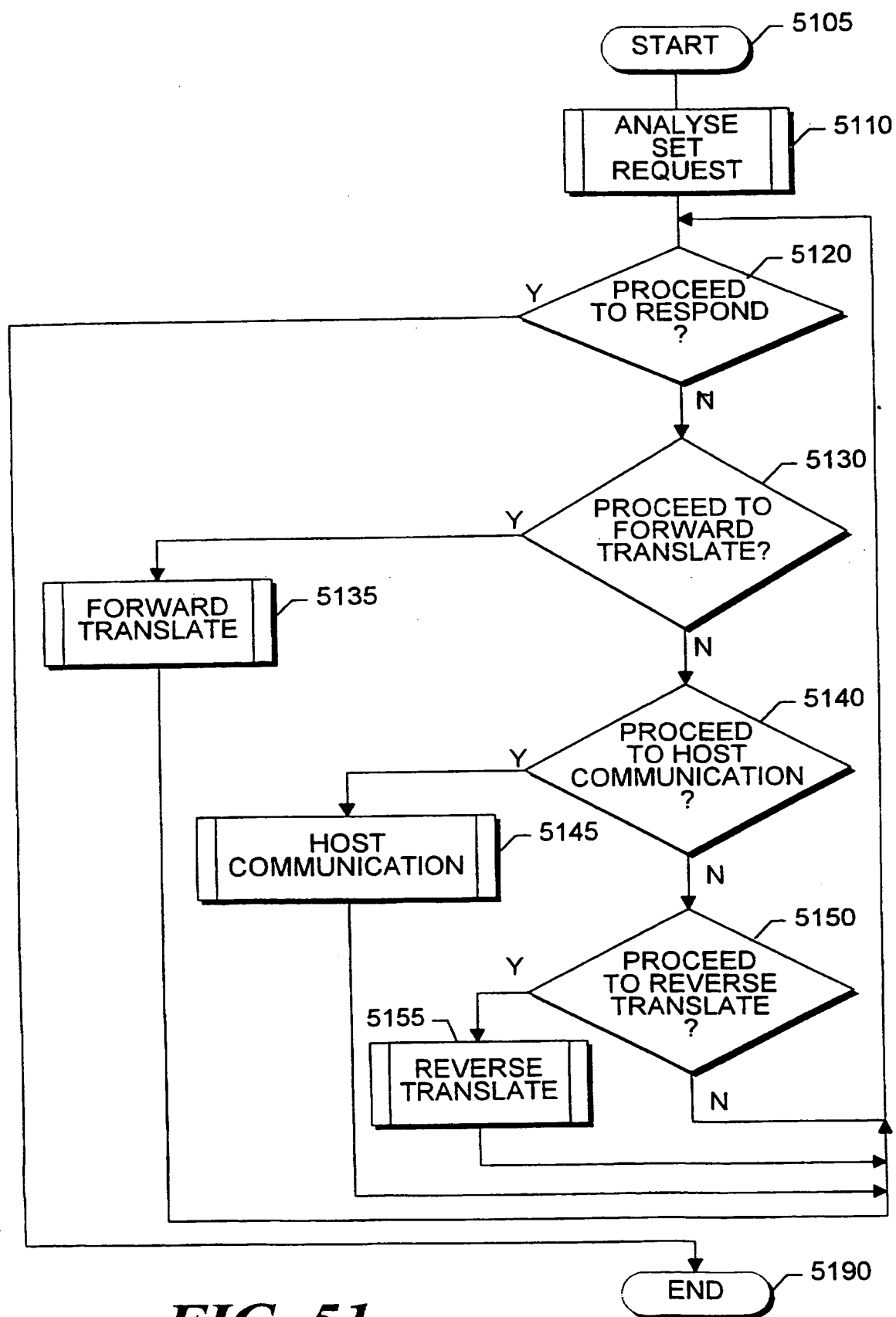
- 1 22. The apparatus for communicating between a server, a gateway and a host as
2 recited in claim 15, further comprising:
- 3 (a) means for establishing a first communication link between the server and the
4 gateway;
- 5 (b) means for logging transaction information in a first transaction database at
6 the server;
- 7 (c) means for transmitting a transaction from the server to the gateway over the
8 first communication link;
- 9 (d) means for establishing a second communication link between the gateway and
10 the host;
- 11 (e) means for logging transaction information in a second transaction database
12 at the gateway;
- 13 (f) means for transmitting a transaction from the gateway to the host over the
14 second communication link;
- 15 (g) means for receiving a transaction response from the host;
- 16 (h) means for parsing the transaction response to obtain an index to the
17 corresponding logged transaction information in the second transaction
18 database in the gateway;
- 19 (i) means for updating the transaction response in the second transaction
20 database in the gateway with information from the response transaction from
21 the host;
- 22 (j) means for transmitting the response transaction to the server over the first
23 communication link;
- 24 (k) means for parsing the transaction response to obtain an index to the
25 corresponding logged transaction information in the first transaction
26 database in the server;
- 27 (l) means for updating the transaction response in the second transaction
28 database in the server with information from the response transaction from
29 the host; and
- 30 (m) means for displaying payment information corresponding to the transaction
31 on a display.

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**FIG.-49****FIG.-50**

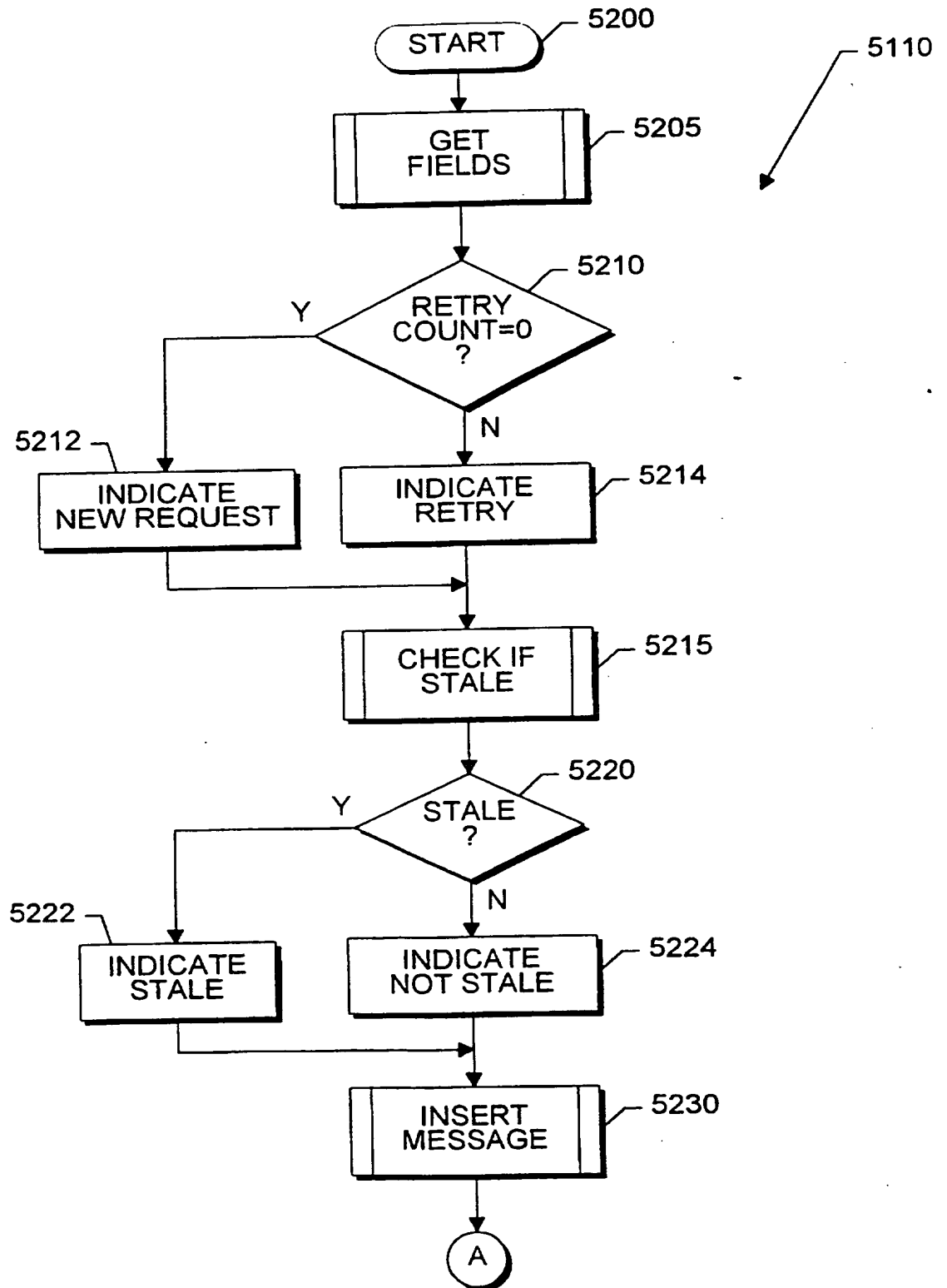
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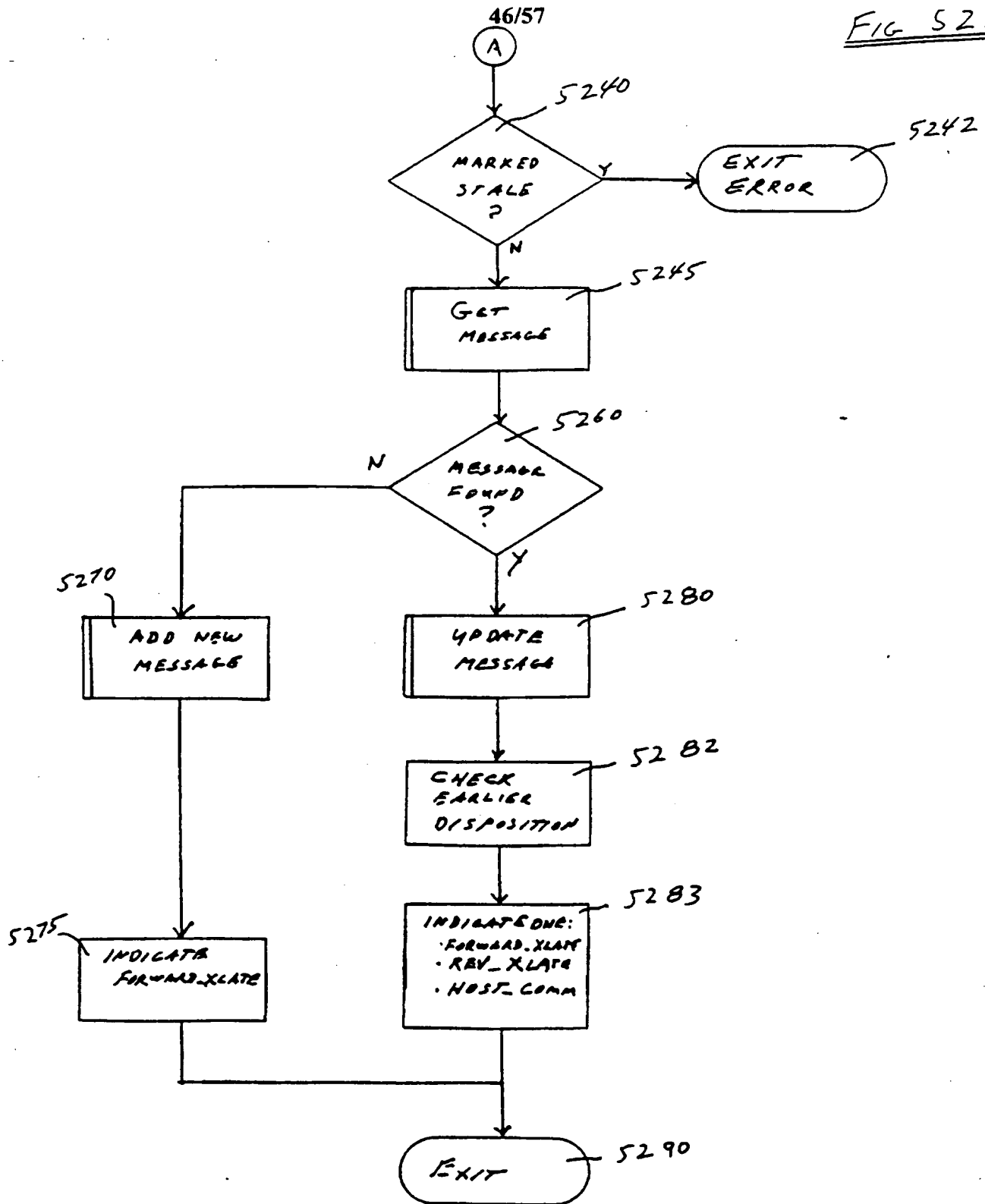
**FIG. 51**

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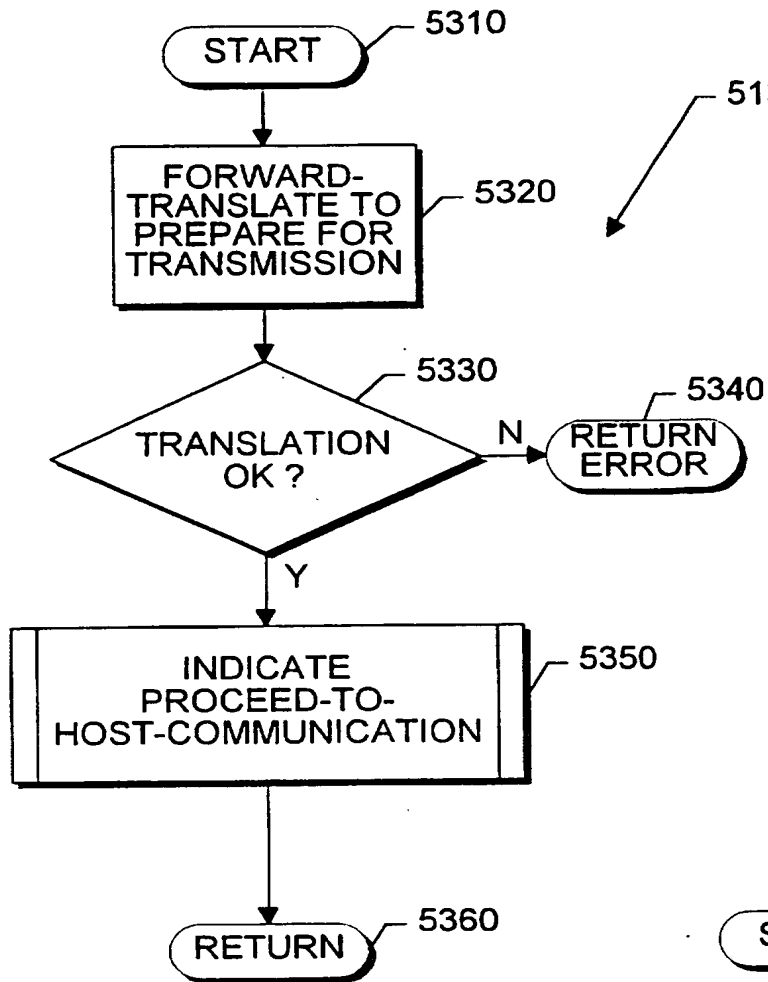
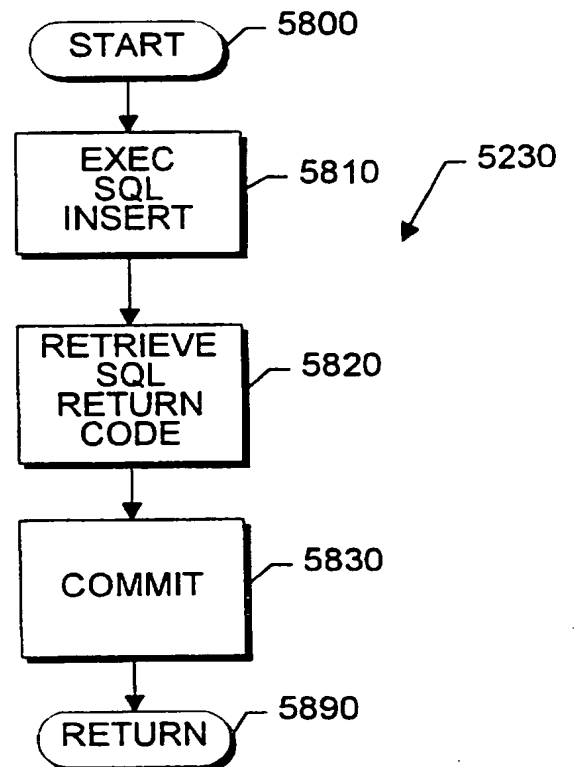
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**FIG. 52A**

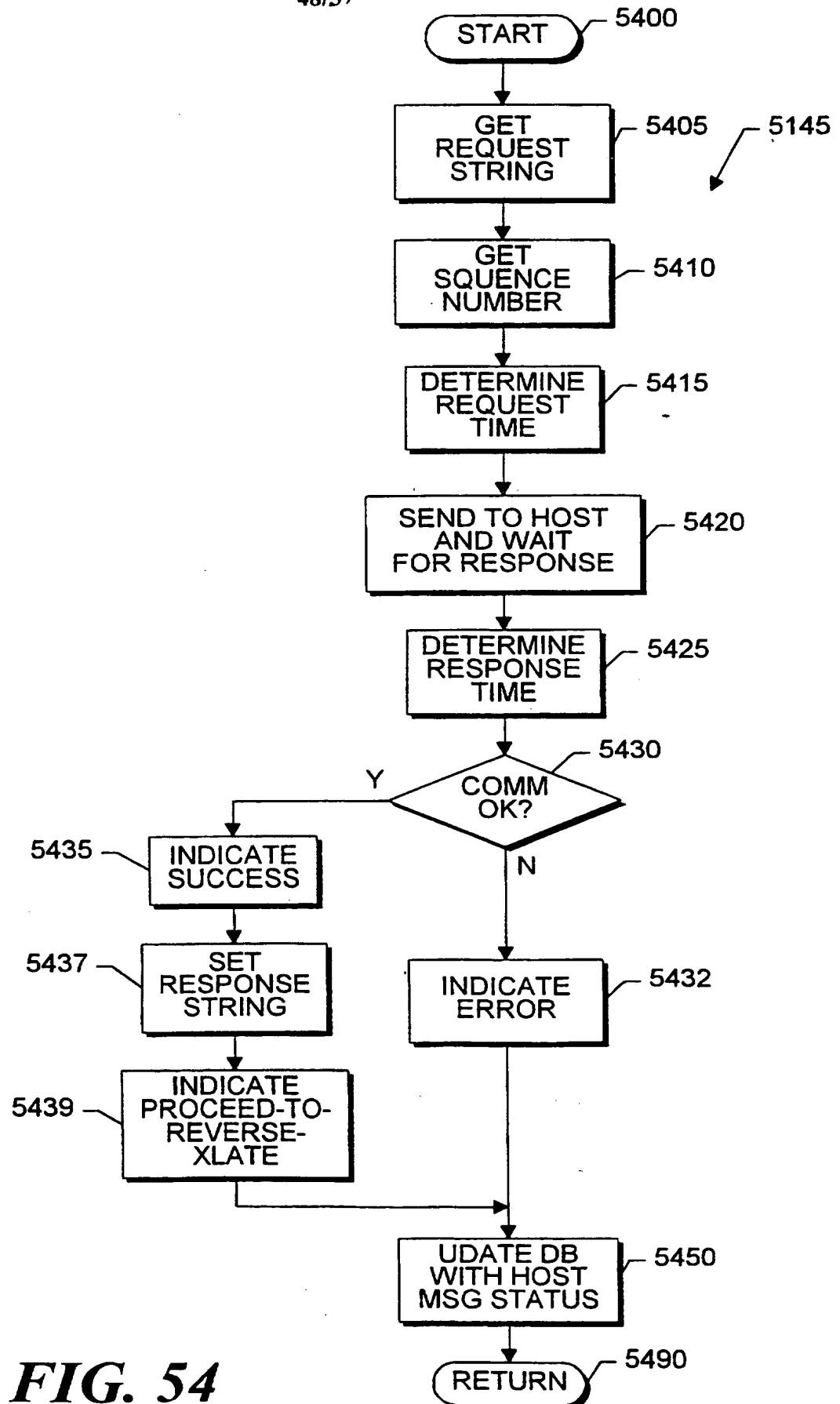
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FIG 52B

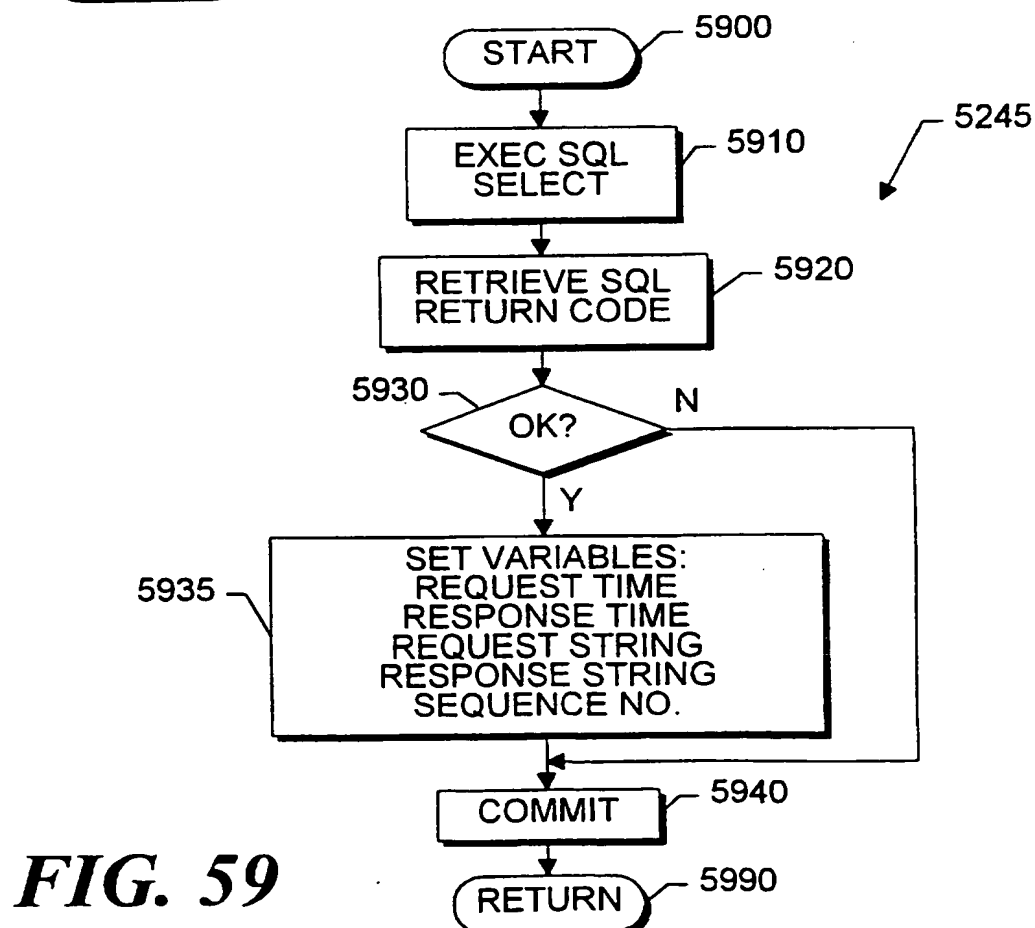
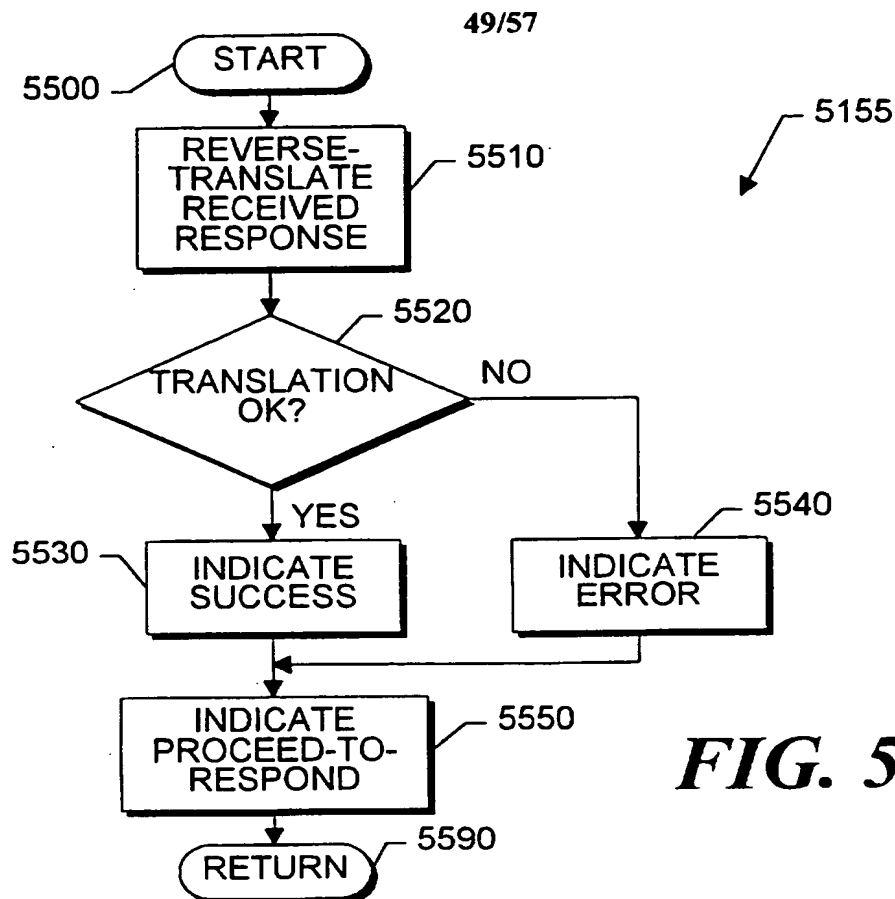
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**FIG. 53****FIG. 58**

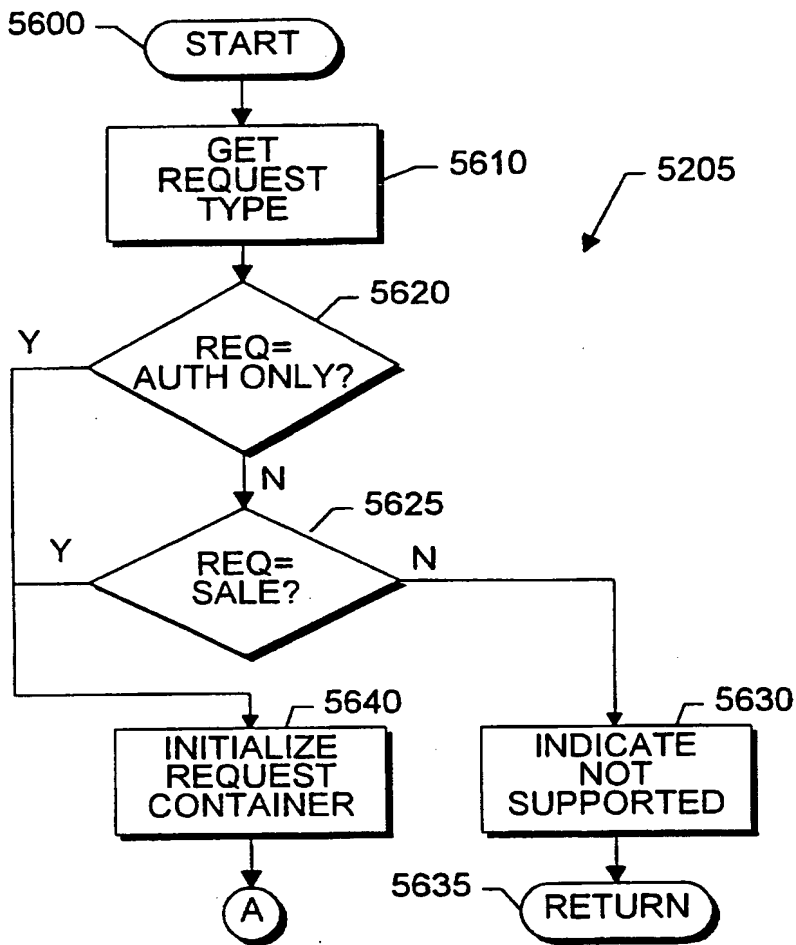
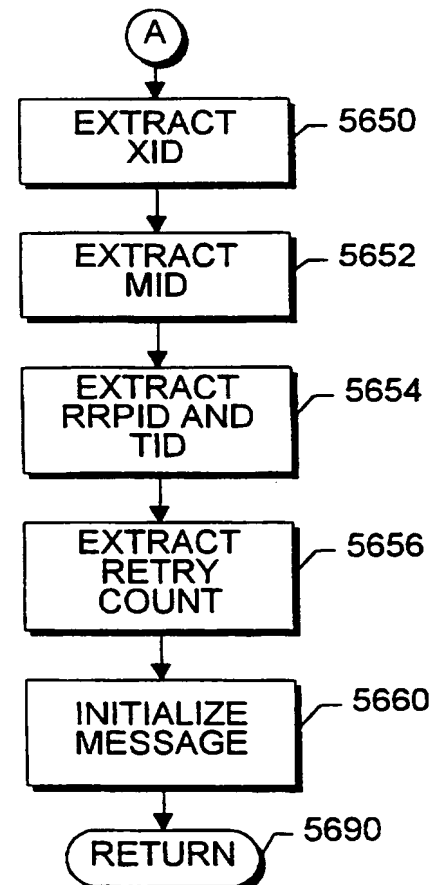
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**FIG. 54**

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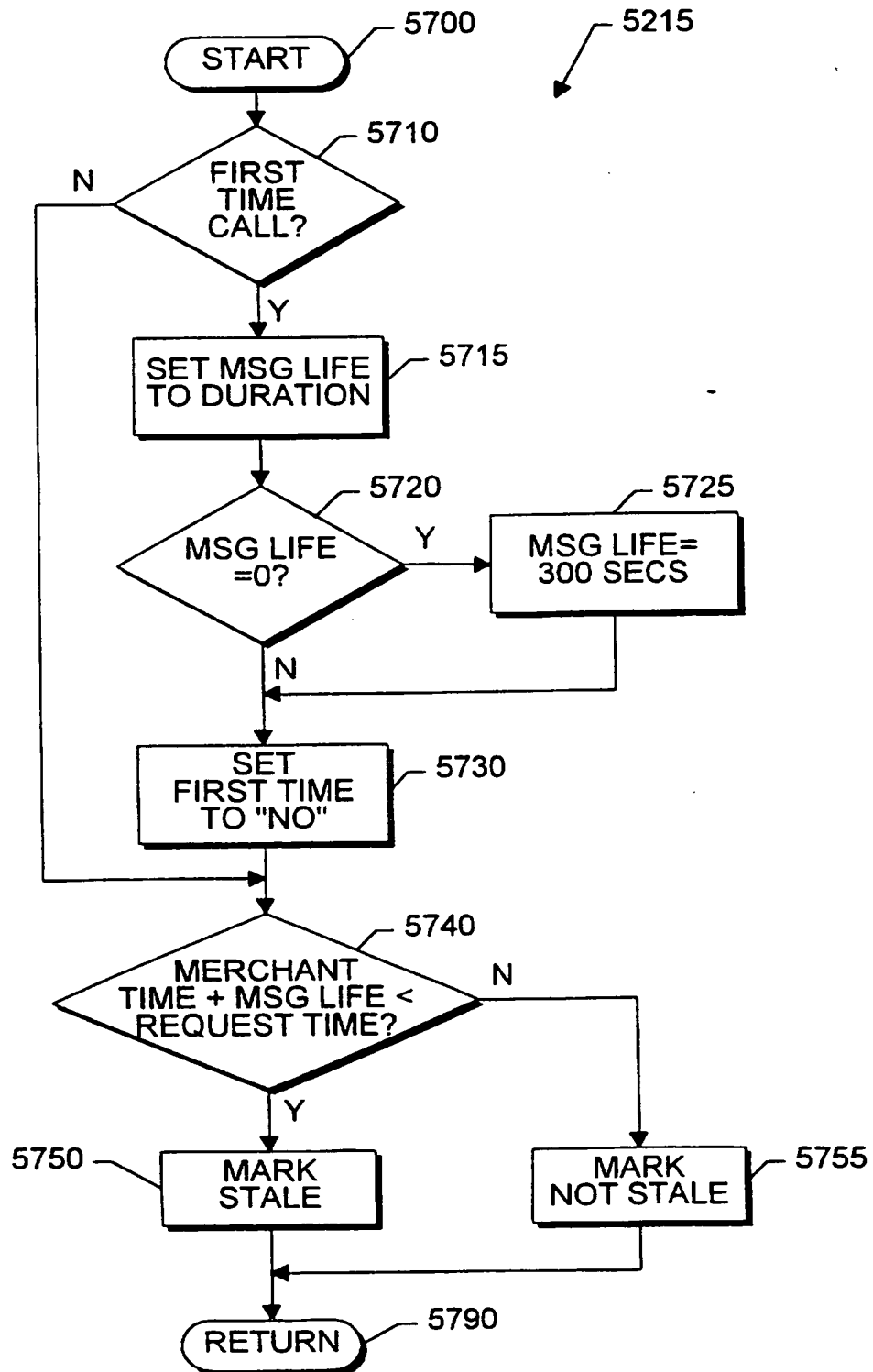


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**FIG. 56A****FIG. 56B**

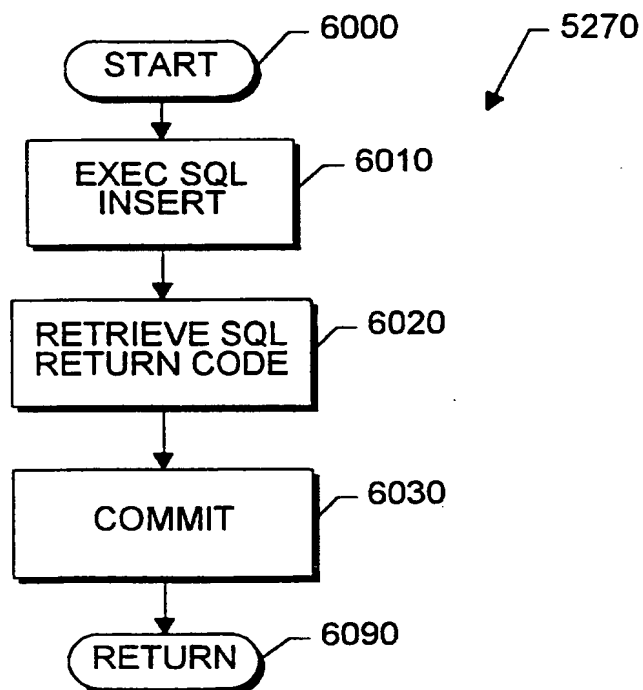
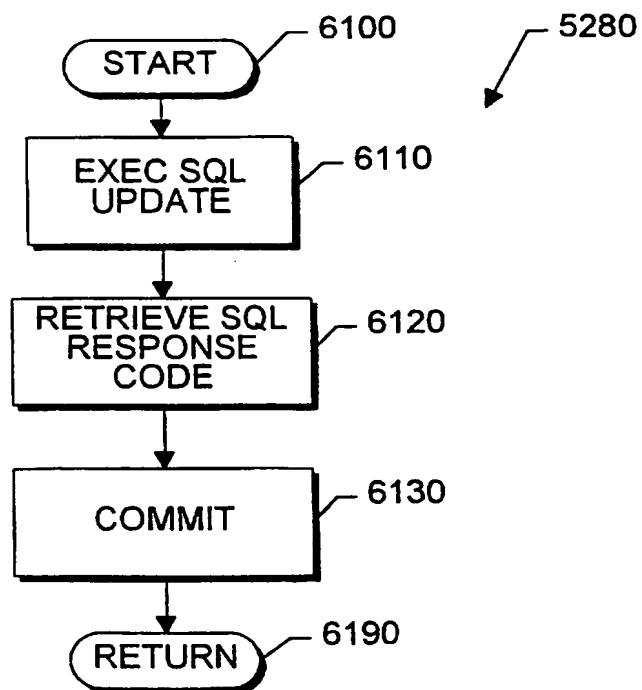
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**FIG. 57**

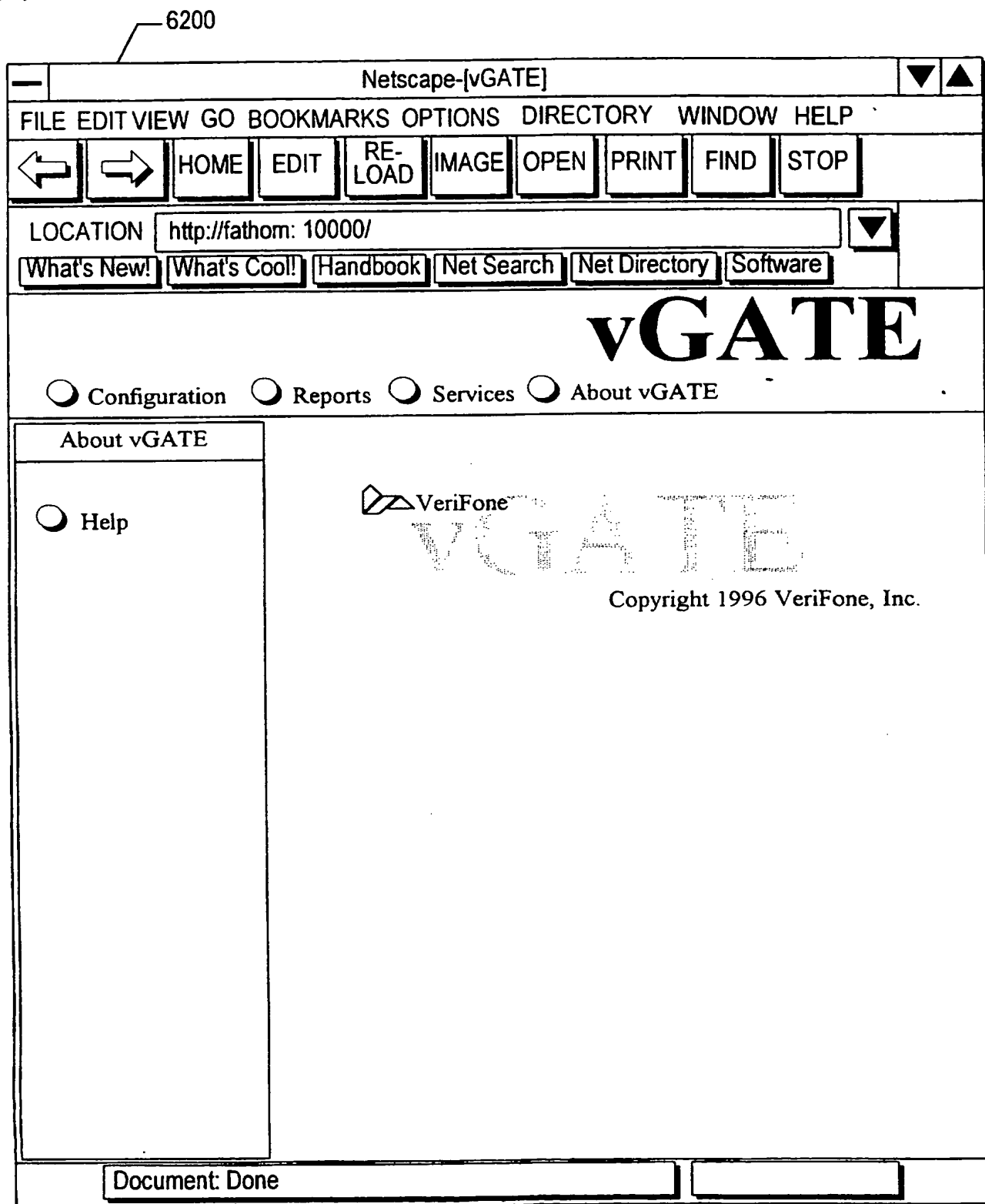
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**FIG. 60****FIG. 61**

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**FIG.-62**

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Netscape-[vGATE]

FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP

LOCATION

vGATE

☐ Configuration
 ☐ Reports
 ☐ Services
 ☐ About vGATE

Configuration

☒ Merchants

☐ Stale Message

☐ Host Communication

☐ Help

To Add a merchant to the Merchant database click [here](#). To delete or edit information of a merchant, click on Delete or Edit.

Mid	Merchant Name	Edit	Delete
1111111	Garden Excape Inc.	Edit	Delete
3216805	Internet Payment Consulting Ltd.	Edit	Delete
7135267	Legal Eagles Corporation	Edit	Delete
2222222	Paperback Software Inc.	Edit	Delete
5555555	Venezia Pizza	Edit	Delete

Document: Done

FIG.-63

SUBSTITUTE SHEET (RULE 26)

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Netscape-[vGATE]

FILE EDIT VIEW GO BOOKMARKS OPTIONS DIRECTORY WINDOW HELP

← → HOME EDIT RE-LOAD IMAGE OPEN PRINT FIND STOP

LOCATION

What's New! What's Cool! Handbook Net Search Net Directory Software

vGATE

☐ Configuration ☐ Reports ☐ Services ☐ About vGATE

Configuration

☐ Merchants

☐ Stale Message

☒ Host Communication

☐ Help

Host Communication

This screen allows the user to configure the paramters for the vGATE to communicate with the Host adaptor device. The paramters needed are:

IP Address 6410

Port 6420

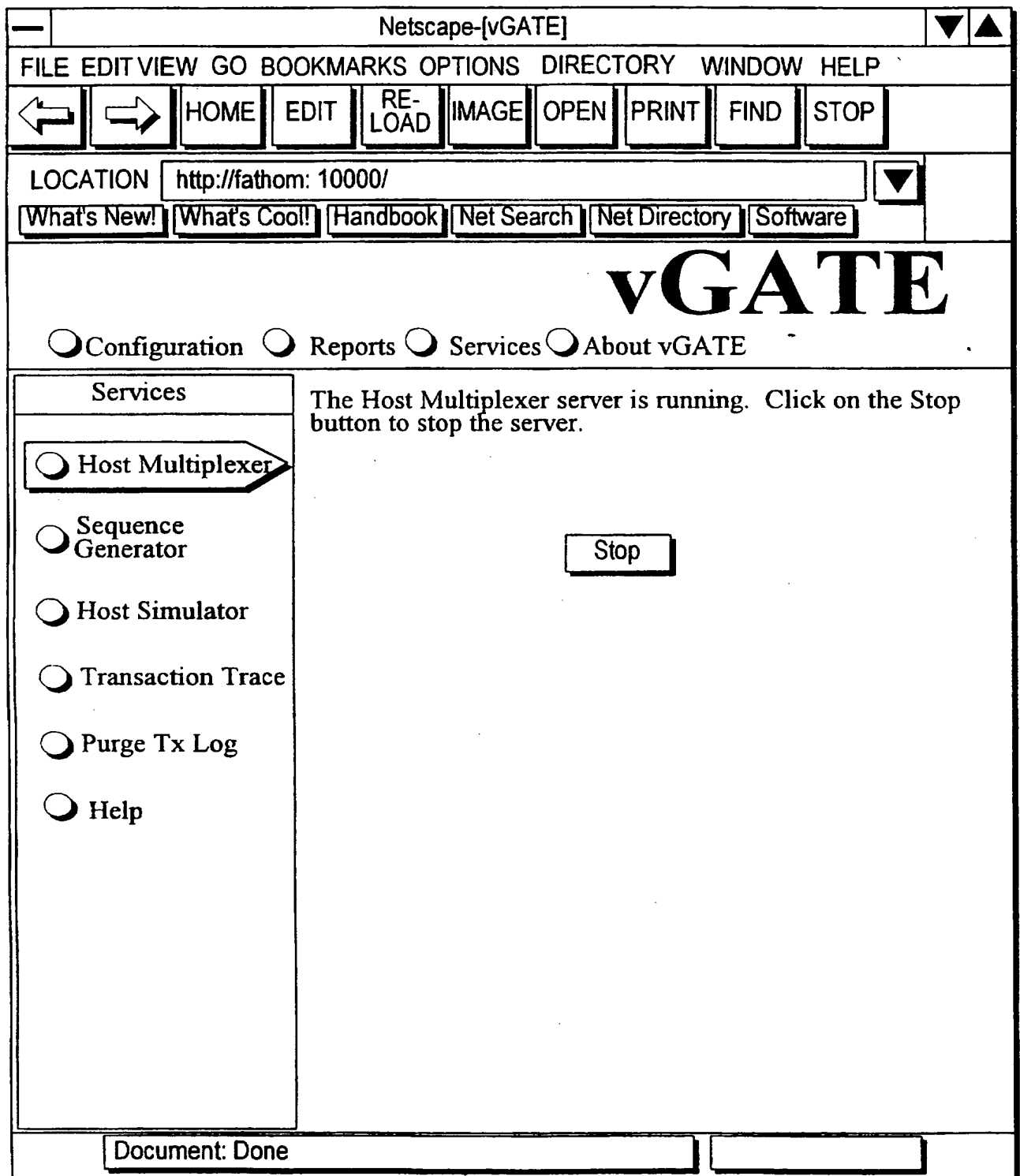
6430

Document: Done

FIG.-64

SUBSTITUTE SHEET (RULE 26)

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**FIG.-65**

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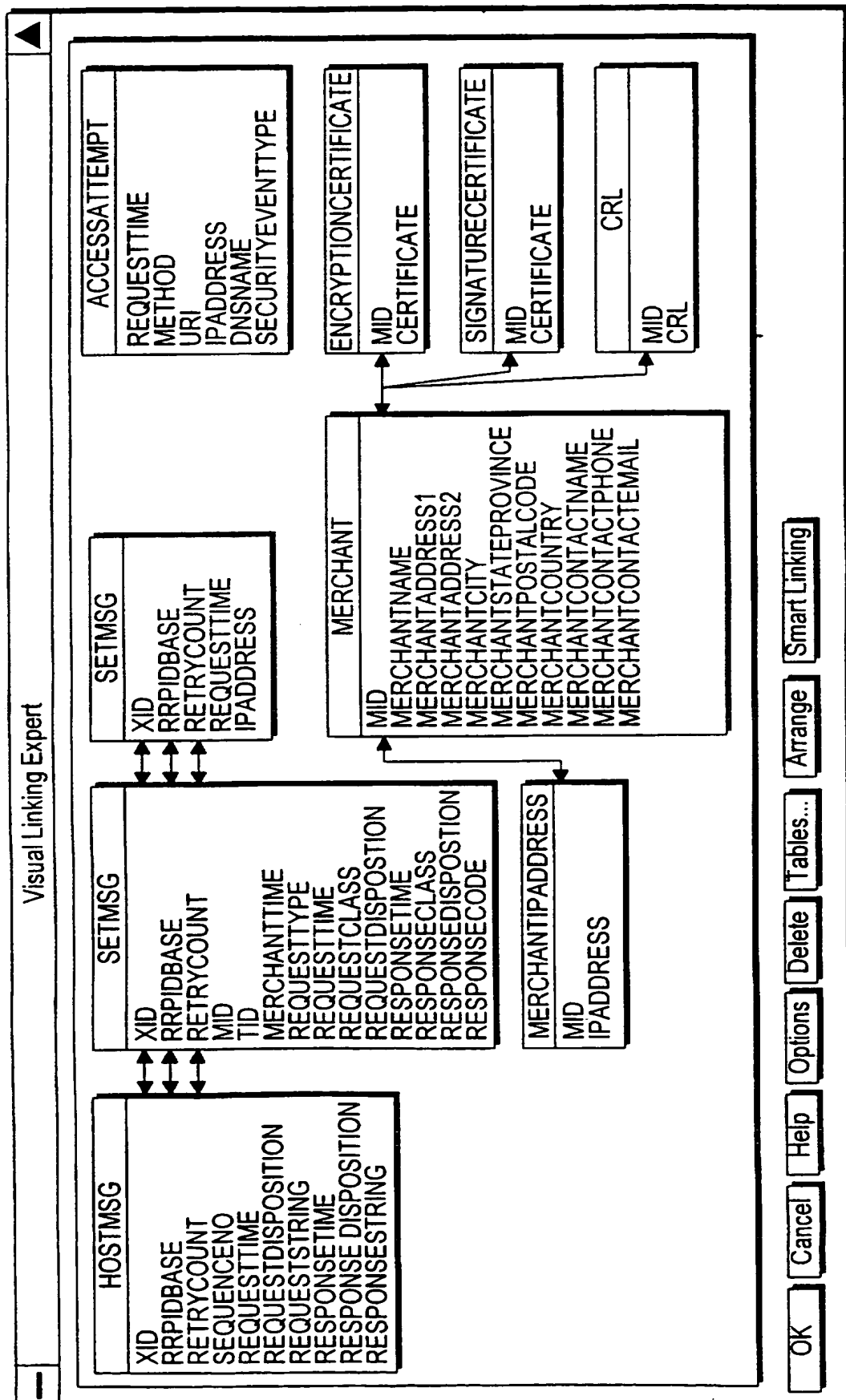


FIG.-66

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 97/10402

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F17/60 G07F19/00 G07F7/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G07F G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 658 862 A (AT & T) 21 June 1995 see the whole document ---	1,2,8, 15,16,22
A	EP 0 501 697 A (AMERICAN TELEPHONE AND TELEGRAPH COMPANY) 2 September 1992 see abstract; claims; figures 3-7 see column 7, line 25 - column 9, line 11 see column 11, line 18 - line 42 ---	1-6, 8-13, 15-20,22
A	WO 96 13013 A (OPEN MARKET) 2 May 1996 see abstract; claims; figures --- -/--	1-3,5,6, 8,15-17, 19,20,22

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

15 December 1997

Date of mailing of the international search report

22/12/1997

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Authorized officer

David, J

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/10402

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0658862 A	21-06-95	US 5521966 A CA 2118547 A,C CN 1120202 A JP 7200425 A	28-05-96 15-06-95 10-04-96 04-08-95
EP 0501697 A	02-09-92	AU 640855 B AU 1089692 A CA 2059078 A,C JP 5095405 A MX 9200763 A US 5329589 A	02-09-93 03-09-92 28-08-92 16-04-93 01-08-92 12-07-94
WO 9613013 A	02-05-96	EP 0803105 A	29-10-97
EP 0440515 A	07-08-91	AT 126913 T AU 631715 B AU 6994791 A CA 2034711 A DE 69112234 D DE 69112234 T ES 2076482 T JP 4213161 A US 5136633 A	15-09-95 03-12-92 01-08-91 31-07-91 28-09-95 04-04-96 01-11-95 04-08-92 04-08-92
US 5018196 A	21-05-91	JP 2112794 C JP 8027812 B JP 62254543 A JP 62056043 A JP 2170184 A US 4885777 A DE 3687934 A EP 0214609 A	21-11-96 21-03-96 06-11-87 11-03-87 29-06-90 05-12-89 15-04-93 18-03-87

INTERNATIONAL SEARCH REPORT

Internat'l Application No
PCT/US 97/10402

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 440 515 A (VISA) 7 August 1991 see abstract; claims; figures -----	1,2,5,6, 8,15,16, 19,20
A	US 5 018 196 A (K. TAKARAGI) 21 May 1991 -----	